THE MARINE REVIEW

VOL. XXXIV. CLEVELAND, AUGUST 30, 1906. No. 9.

## THE DOVER-OSTEND TURBINE STEAMSHIP PRINCESSE ELISABETH.

A new steamship built by the Cockerill Co. was started running on Sept. 11, 1905, by the Belgian government; its main feature is that the power is obtained by high-speed turbines. The other mailboats in use on the same service, like most light draught ships built of recent years, are propelled by paddles driven by reciprocating engines. This system, quite apart, from the great weight of the paddle wheels, has the disadvantage of possessing a large number of parts which are outside the hull, and these are consequently exposed to damage if they strike any wreckage or even if the sea is rough.

This inconvenience is reduced to a minimum in the case of turbine boats, where the only part in contact with the water is the screw fixed at the end of the propeller shaft and protected by the sternpost. By using very high-speed turbines it is also possible to reduce the weight and bulk of the machinery, i. e., to increase the carrying capacity and the speed of the boat.

In the case of paddle steamers, the large amount of immersed surface produces a very great resistance when the engine is reversed, so that the ship stops very quickly. This is a very important point, especially in the channel during fogs or in coming across another vessel. The earlier turbine boats were fitted with rather weak turbines for driving the ship backwards, and this was by no means safe in the case we are considering. The Princesse Elisabeth has sufficiently powerful turbines to drive the ship backwards at a speed of 16 knots. It follows that even when doing 20 knots, this boat can be stopped within two-and-a-half times her own length.

The contract specified a speed of at least 22½ knots when going ahead, and 13 knots when going astern. As the trial runs given below show, these conditions were much more than satisfied, for the new steamship attained an average speed of 24 knots, and so beat the world's record for a passenger boat.

The other boats belonging to the Belgian government made their trial runs in Scotland, on the estuary of the Clyde, between Clock Point and the Cumbrae lighthouses. In order to get accurate and undeniable bases for comparison between the turbine boats and the earlier paddle boats, the government specified that the turbine boat trials should be run under the same conditions.

The distance between the two lights is 13.666 knots. It is not, therefore, a case of single measured mile run which, with such a fast vessel would only take a few minutes and scarcely be of any value. Moreover, the boat was not to slacken speed after passing the two lights, but was to keep on at the same speed while turning beyond the lights.

The results obtained are shown in the following tables. We may remark that Greenwich time is used in Belgium but that twenty-four hour time is in vogue. The trials took place on August 9, 1905, at a time when the tide had the least effect. The sea was calm, and there was a light breeze from W. S. W.

The official commission stated that on several occasions when running ahead, the boat had to go out of its course to avoid other vessels. The commission therefore stated that it was certain the real mean speed exceeded 24 knots. The Princesse Elisabeth is thus at present the fastest passenger boat afloat. As for running astern, it was thought enough to run the measured mile only, and, indeed, the minimum specified speed, 13 knots, was so greatly exceeded that it was

A.—RUNNING AHEAD.

| Times of Passing | | Time Occupied on Run | Speed in Knots and Means | | | | Mean number of revolutions of the three screws per minute | Vacuum in condensers, in millimeters (in inches) | | Pressure of air in ashpits of boilers in millimeters (in inches) of water |
|---|---|---|---|---|---|---|---|---|---|---|
| Clock Point | Cumbrae | | | | | | | Port | Starboard | |
| 13 h. 24 m. 54 s. | 13 h. 59 m. 19s. | 34 m. 25 s. | 23.824 | | | | 507.2 | 67.6 (2.662) | 67.7 (2.665) | 44 (1.732) |
| 14 h. 11 m. 50 s. | 14 h. 45 m. 39 s | 33 m. 49 s. | 24.247 | 24.035 | | | 488 | 67.5 (2.658) | 68 (2.677) | 46 (1.811) |
| 14 h. 56 m. 27½s | 15 h. 31 m. 8 s. | 34 m 40½s. | 23.653 | 23.950 | 23.993 | 23.964 | 492 | 67.5 (2.658) | 68 (2.677) | 46 (1.811) |
| 15 h 41 m. 6 s. | 16 h. 15 m. | 33 m. 54 s. | 24.187 | 23.920 | 23.935 | | 491 | 68 (2.677) | 68.5 (2.697) | 48 (1.890) |

B.—RUNNING ASTERN.

| Times of passing the measured mile | | Time occupied on Run | Speed in Knots and Means | | Mean number of revolutions of the two side screws per minute | Vacuum in condensers, in millimeters (in inches) | | Pressure of air in ashpits of boilers in millimeters (in inches) of water |
|---|---|---|---|---|---|---|---|---|
| First Beacon | Second Beacon | | | | | Port | Starboard | |
| 16 h. 50 m. 30 s. | 16 h. 54 m. 9½ s. | 3 m. 39½ s. | 16.400 | 16.183 | 411 | 67 (2.638) | 67 (2.638) | 48 (1.890) |
| 17 h. 4 m. 41 s. | 17 h. 8 m 26½ s. | 3 m. 45½ s. | 15.965 | | 417.5 | 67 (2.638) | 67 (2.638) | 48 (1.890) |

not worth while making any further trials.

Owing to the use of high-speed turbines, the vibration and shaking produced on paddle ships and ordinary screw ships are quite eliminated and the boat is remarkably steady while running at full speed. The other seagoing qualities of the boat leave nothing to be desired. All the arrangements of this interesting specimen of naval architecture are so luxurious and comfortable as to compare favorably with the great Atlantic liners.

The boat has two masts and two funnels. It has three long decks, and one steel hurricane deck, which stretches from side to side and over about two-thirds the length of the promenade deck. A Marconi wireless telegraphy apparatus is provided. There are eight lifeboats hung on "Welin" davits, so that they can be lowered into the water almost instantaneously.

The hull of the vessel is of light steel; it has very fine lines which enable it to cut through the water, even at high speeds without making the large waves which less well proportioned vessels generally cause. The vessel has two steering gears, one in the bow for use in docks, and the other in the stern operated by a Brown apparatus. The water-ballast bunkers are at the two ends of the boat. The mail room is forward and the luggage room aft; both have a 1,000-kilogram (2,200 lb.) electric crane. On the top deck are the lifeboats, the captain's cabin and the signaling apparatus.

The promenade deck has the smoking room, twenty state cabins for passengers, the royal saloon and the staircases leading down to the restaurant and the first-class cabins. The windlass for hauling up the anchors is forward, and the hand steering wheel and a Brown capstan are aft.

The dining-room, which can accommodate 120 people sitting at separate tables, is on the main deck. The cabins belonging to the officers and crew are aft of the engine-room. On the lower deck there is accommodation for sixteen of the crew, and there are first and second-class saloons for ladies and gentlemen, besides various other offices. Another saloon and offices for second-class passengers are situated aft. In addition to the crew which consists of seventy, the ship can carry 1,000 passengers. The lighting is effected by 300 electric lamps distributed in the different places, and by a powerful electric searchlight.

Below are a few particulars about the mechanical details of this mail boat.

Length between sponsons, 334 ft.; total length outside plates, 357 ft.; beam outside main ribs, 40 ft.; total beam outside fenders, 42 ft.; depth of hold at promenade deck, 23 ft. three in.; depth of hold at main deck, 15 ft.; mean draught, 9 ft. 7 in.; displacement, 1,950 tons.

This consists of Parsons' turbines, three for going ahead and two for going astern. For going ahead, there is a high-pressure turbine situated along the center line of the ship, and two low-pressure turbines, one on each side. These three turbines can together develop 12,000 to 13,000 H. P. When going ahead under normal conditions, the steam from the boilers enters the high-pressure turbine, and after passing through it goes to the low-pressure turbines from which it exhausts into condensers, one on each side.

Each of these turbines drives direct a polished bronze screw propeller. The number of revolutions provided for in the calculations was 470 per minute. The two turbines for going astern are contained in a special division of the casing enclosing the low-pressure turbines for going ahead, and act on the screws which are fixed to the latter. The controlling gear, which is below, near the turbines, is of a new design. The reversing is effected by balanced distributor pistons worked by servomotors.

The steam generating plant includes eight return boilers arranged in two sets of four, each having its combustion chamber and funnel. Each boiler has three corrugated furnaces. The total heating surface is 1,840 square meters (19,806 square feet); the grate area is 45 square meters (53.82 square feet); the forced draft is produced by means of two large Howden fans; the highest pressure of air admitted into the ashpits is 50 millimeters (1.968 inch of water); the working pressure of the steam is 150 lb. per square inch.

Three Weir steam feed-pumps, one of them as reserve.

A heater in which the feed water is heated by the exhaust steam of the auxiliary engines; if any steam is produced in it, an automatic valve makes it escape into the condensers.

Two Weir centrifugal circulating pumps. The steam cylinder of each of these pumps also works a dry air pump.

Two sets of ordinary Weir dry air pumps. These pumps have one double-action steam cylinder operating two single-action pumps by means of a beam.

One Weir steam pump (hold, fire, deck, etc.)

One Weir steam pump for the water ballast.

Two Weir steam pumps for supplying oil to the turbine bearings.

One Weir steam pump for supplying water to the bearings of the shaft in the tunnel.

Two large Howden fans for the forced draft, worked direct by tandem compound engines, single action.

Two steam turbines for the electric light and for the electric cranes.

## SHIP BUILDING ON THE PACIFIC COAST.

The steam schooner Jim Butler is now under construction at the yards of Lindstrom's Ship Building Co., Aberdeen, Wash. Capacity, 600 gross tons; dimensions, 180 x 38 x 12.5 ft. She is to have one engine, 14 x 32 x 24 in.; and one boiler, 10.5 x 11 ft. The machinery is being built by the Willamette Iron & Steel Works, Portland, Ore. The schooner is owned by Olson & Mahoney, San Francisco.

The steam schooner Hornet is being built for Fred Linderman, of San Francisco, by Lindstrom's Ship Building Co., Aberdeen. Capacity, 625 gross tons; 180 ft. long, 38 ft. wide and 13 ft. high. She will have one engine, 14 x 32 x 24 in., and one boiler, 10.5 x 11 ft. The machinery is being constructed by the Fulton Iron Works, San Francisco.

The Open River Transportation Co., of Portland, Ore., is having built at the yards of the Willamette Iron & Steel Works, Portland, a river steamer for use on the upper Columbia. She will be 150 ft. by 33 ft. by six feet, and will have two engines, 16 x 72 in., and one boiler, fire box 60 in.

Lindstrom's Ship Building Co., Aberdeen, is building a steam schooner for Beadle Bros., San Francisco, the machinery being constructed by Fulton Iron Works. Capacity, 620 gross tons; 180 ft. by 38 ft. by 12.5 ft. It will have one engine, 14 x 32 x 24 in., and one boiler, 10.5 x 11 ft.

Joseph Supple is building at his yards at Portland, Ore., thirty-three barges, in sizes from 80 x 20 to 125 x 32 ft.; for the Portland & Seattle Railway Co., for use in constructing bridges across the Columbia and Willamette rivers, the line being a combination of the Great Northern and Northern Pacific railways.

The screw steamer Kitsap, wood, 195 gross tons, has been built for Kitsap Transportation Co., Seattle, Wash., by Joseph Supple, of Portland, Ore. Dimensions, 136 x 24 x 8 ft. She has one engine, 12 x 19.5 x 33 x 18 in. and one water-tube boiler, 3,000 sq. ft.

## HOW A NINETY-FOOTER BEHAVES IN AN OCEAN RACE.*

### Being a Short Account of the Performance of the Yawl Ailsa in the Race for the Kaiser's Cup Across the Atlantic in 1905.

BY PAUL EVE STEVENSON.

The British-built yawl Ailsa was, with one exception the smallest vessel that took part in this great race, her dimensions being 89 feet load waterline, 131 ft. over all, 26 ft. beam and 17 ft. draught, her gross tonnage amounting to 116. She was designed by William Fife and built in Scotland in 1895. When she was first spoken of as a possible entrant for the race, there were many who considered it a preposterous conception and one that was worth hardly more than a passing thought. "What, enter this 'crazy-eyed racing machine,' this 'composite basket' in a race across the North Atlantic! Even if she was a Scotch-built boat, she came over originally in a slow canter; not under skittering racing sticks that she'll have to carry now to make any showing at all." In this manner these maritime Solons expelled their weighty views and shook their salty locks. Gradually, though, interest in the undertaking gathered energy, and when the fine performances were recalled of the Vigilant and Navahoe in their ocean passages in fast time and without mishap, popular opinion among yachtsmen experienced a change of sentiment to a great degree and a lively interest was kindled among them when Ailsa was definitely entered in the great contest. This interest continued to grow when the insignificant size of the boat compared with some of her big competitors was appreciated; and the experts reached the same conclusion, namely, that her only chance of winning lay under but one condition of weather, to wit, smooth seas and a head wind, or at least a close reach. Ailsa had left a very creditable record behind her after a long series of races with the Prince of Wales' Britannia, and if it should happen that we could find for her conditions favorable to her type, she stood a very good chance of finishing among the first three. No one thought of her as a possible winner in any other sort of weather, for in strong, fair winds her large antagonists would overpower her and in the event of heavy weather they would simply drown her out.

Immediately prior to the start, Ailsa was overhauled as completely as possible alow and aloft; she was entirely replanked in many places, and generally strengthened so as to withstand the severe tests of a deep-water race. Among other preparations, five feet were clipped from her bowsprit, short as it was, till it seemed no more than the pointed end of a cigar jutting out of the stem, while the mizzen or jigger had been cut down to nothing but the pocket handkerchief of ancient tradition. She carried, however, her racing mainmast and the mainsail itself was of the exact size for smooth-water racing. She also carried an extra stout triangular storm trysail—the riding sail of the Grand Bankers—made of Irish flax, which was bent to the mast with toggles when required. A hooded slide was built over the forecastle hatchway and another one over the skipper's hatch immediately forward of the wheel; while wooden battens and strong canvas covers were fitted for the skylights fore and aft.

The small boats carried in case of accident were fishermen's dories, lashed three in a nest just aft of amidships, the most wretched type of small boat imaginable in case of a quick exit, except in the hands of fishermen born and bred in them and who know every detestable humor of these craft. The writer's opinion on this subject may not be of monumental worth, but he has had a good deal of experience in them with the fishermen out of Marblehead and the Kennebec; and while it is true that on the Banks a dory carries a ton of fish and two men in a heavy jumble of sea, these men know what they are about and are not asked to jump unaccustomed into them, three or four men to a dory, in a heavy, breaking sea. If it should come to abandoning the ship, this purpose being the only excuse for their presence on board, the result would be much too painful to contemplate. It is true that two large, strong boats secured amidships would have occupied more deck space than the nests of dories; but they would have possessed the incalculable advantage of usefulness in a disaster. That the Yankee dory, strictly indigenous to New England, is the finest sea-boat of its size known to sailors when properly handled, is a fact beyond dispute; but one has to know them from the cradle upward to understand all their madness in a seaway. Several of the other racers also carried dories as well as Ailsa; and only a providential immunity from an occasion to utilize them in heavy weather prevented what must have been a miserable loss of life. The notion of five or six men living in one of these little fourteen-foot boats in a breaking sea until picked up is unthinkable.

Because of our handiness as a racing "machine" we were enabled to get away first across the line at the start, followed immediately by Hildegarde, Atlantic, Endymion, and Hamburg, the later being the only other pure racer in the fleet besides ourselves, though much larger and more powerful. On board of us there were 28 persons all told, three of us aft in the cabin, while the ship's company included a skipper, two mates, steward, mess boy, two cooks, and 18 men before the mast—precisely the complement that handles a modern two-thousand ton sailing ship with thirty-five hundred tons of cargo aboard. Our cabin had been cleared of all unnecessary furniture and decorations and a large icebox had been built into the floor; and as a vasty hummock of storm canvas occupied the rest of it, locomotion below was not accomplished by the customary methods. No carpets were down to hold any water that might be shipped, though this was a vain precaution, for the only salt water that found its way below in the whole fortnight was a bucketful through the inadvertently opened companionway. From the beginning of the passage till we let go in Southampton water, Ailsa leaked no more than could be pumped out in five minutes each watch, even in heavy weather that we ran into in mid-Atlantic—a very different fulfillment of the dark prophecies that sprang from certain quarters before the start, when a basket was too sound an article for comparison with Ailsa's hull. It is also not unworthy of comment that only during the first six hours of the voyage did we have a head wind; after dusk fell that first night at sea we held the Jersey coast aboard, while most of the others split tacks and went away along the Fire Island beach. About ten p. m. the wind shifted into the southward from E. N. E., and never again headed us during the three thousand miles—a first hand illustration of the "brave west winds" of the Atlantic.

For two or three days afterward, the breeze held true and fresh from the southwest, and because it was fair we were able to carry all our kites, including the spinnaker until it split one afternoon, after the spinnaker boom had soared up to the spreaders in a heavy roll and broke into three pieces. We fished this boom, however, but lost a twenty-foot section out of the middle of it, and during the rest of the passage we utilized the balloon jibtopsail as a spinnaker, as the original one would have been too large for the shortened boom. The sea had increased

*Read at the annual meeting of the Society of Naval Architects and Marine Engineers.

somewhat by this time and was running under us in swift, white ridges; and Ailsa here first indicated how abominably this type of vessel steers running before a fresh wind and sea. With no forefoot to hold her steady, she yawed to every sea at least five or six points in spite of the most skillful steering. Nearly half the time the spinnaker was aback and was hindered from swinging inboard only by heavy preventers. Indeed one of the most disagreeable nights of the passage occurred in this part of the ocean, when on one occasion the wind had let go to a great degree; Ailsa minded her helm no more than if she had been rudderless, and teetered about on the crests with the big mainboom in charge of the deck, hesitating whether to jibe over or not. Later on this same night heavy rain squalls came on from the southward, and though there was not much wind in them we lowered down the mainsail and set the trysail for the first time. Having to depend on one mast entirely (for the absurd little sapling in the stern was a negligible quantity nearly all the passage) we had to take great care of the big boom, not having the advantage of the two and three-master schooners that can afford to take some risks on their several spars. As for the trysail, it proved to be of almost incredible utility; many times afterward in the race, when running before it, with the eighty foot boom flinging around and nearly ripping things asunder when brought up short by the traveler, we would put the gaskets on the mainsail, get the little trysail bent and fill away again in perfect comfort; indeed, quite half the race was run under this sturdy little sail. With more placid conditions, however, Ailsa sailed a splendid race, and when laid close to the wind in a fresh breeze with no sea running she steered like a knockabout, her wheel like the balance of a watch; and at times she sailed along for several minutes without a hand on the spokes. But as soon as we ran into a seaway, Ailsa went to pieces, as it were. If the sea was ahead she stopped almost dead short at every rise; if astern, she showed an unconquerable desire to look at her own wake.

Our best day's run was 268 miles, a trifle over eleven knots an hour, while in a single watch we did 50 miles and in one hour covered 13 knots; and our best day's work was followed at once by the only heavy weather we found during the voyage. This was in 45° N., 34° W., or about 1,400 miles E. N. E. from Sandy Hook; in short, mid-ocean. The gale took an entire twenty-four hours to make up from the southward, with violent squalls and then, shifting into the northwest in a succession of furious gusts lasting four or five hours, it settled down at that point to what sailors call a heavy gale, the wind rising to force 9 or 10 in the Beaufort scale, or from 50 to 60 miles an hour. At the end of a day and a half or so, a very high and dangerous sea had made, before which we ran the yacht up to the last moment of safety, and then hove her to on the port tack under the trysail only, with five oil bags over the weather rail. We had run her battened down for thirty hours and with four oil bags out; but at noon she broached heavily twice, the second time under the crest of a high sea; so, bailing out of a bucket to windward to make a "smooth," we put the wheel down, got the trysail sheet aft and stood by. Instead of lurching ponderously up to the wind like a square rigger would do under such conditions, Ailsa came to so swiftly as to almost throw us off our feet, and in less than a minute she lay hove to in perfect ease.

As long as we ran her before it, we had two men lashed to the wheel—merely a precaution—as not a semblance of heavy water boarded the boat, although we naturally had no assurance as to how long this would last; but of solid seas there actually came none on board; no sea broke on deck that a man could not stand up against unaided, and we had to lay her to simply because she would not steer. Of course, this broaching is a very dangerous business, and justified the second mate's pronouncement: "You can call dese sea boats if you like, but de're tam bad ones." Nevertheless, as shown above, we shipped no solid water, and we were doubtless the only racer that could boast thus, with the probable exception of Valhalla, more than ten times our tonnage.

Through the bad weather, whether running or lying to, the easy motion of Ailsa was the most astonishing attribute of the boat; instead of knocking us about with battered shins and mangled joints, we found the rolling and pitching so pliant and comfortable as to astound us who were prepared for the worst moments in our experience. As a matter of fact the rolling and angle of heel, at their utmost, could not approach that of a large sailing ship either running her easting down or hove to in the southern ocean. The height of the largest seas was probably from forty to forty-five feet from crest to trough, about thirty feet shorter than the Cape Horn seas in which the writer was once hove to in a wind-jammer for a considerable period; but every one of these Atlantic seas broke heavily, with a curved edge, from which it was very difficult to get away, and their sides or flanks were almost vertical. The longer the sea, the easier to ride, of course, even though prodigious the height; the big regular Cape Horners by very reason of their size run but five to the mile, and the back or ridge of each individual sea often exceeds a mile in length. These break also, but without the hollow arch of a steep sea; they seem rather to roll along with a tumbling, thick crest. Indeed, had it not been for the "wave" oil, a compound of heavy oils, black and glutinous, which proved almost miraculous in its ability to smooth the crests, we would have had many disagreeable visitors. When we had arrived at Southampton, Lord Brassey, who had finished just ahead of us in Sunbeam came aboard and declared that it was the worst sea that he had seen in twenty years. He also discharged the opinion that crossing in Ailsa was but little short of suicide; but had the baron seen twenty-nine summers instead of sixty-nine, it is probable that our passage would have appeared to him in more brilliant hues.

"You'll have to drive her hard, win or lose," was a frequent counsel that we heard many times before the start. But as a matter of fact, driving a ninety-foot, modern, racing single-sticker with an emasculated forebody in such weather as we had for three days, before a strong gale and ugly sea, is an impossible theory, begot in the minds of those who have perhaps never been out of sight of the land in a bulb-fin racer. In short, it is an anomaly. When a yacht or sailing vessel of any sort, large or small, has a hull under her fit to run with—that is, to drive—she can be driven to the ultimate moment, when she is often pooped and destroyed by the combers astern. But you cannot drive a vessel that has no forebody, practically no keel, whose mast is stepped so nearly in the middle of her that she cannot carry sail far enough forward to keep her ahead of the seas, and whose every inclination is to turn around against her rudder and look at you. She cannot be driven for the reason that she is out of control, and broaches in the crests and loses way, refuses to go ahead, and at any time is liable to lose boats, gear and men in a single sea through broaching. The build of every other vessel in the race enabled her to run out this gale, including Fleur-de-Lys, a smaller boat than Ailsa. Fleur-de-Lys'

decks were full of heavy water for long periods; yet she was driven through it because she was capable of being driven—was built to buck against or to run before a North Atlantic gale. Uncouth as Ailsa was when running, when hove to she rode as high and dry as a swan, shipping hardly a mist of spray. Not a little further misapprehension exists in the minds of many yachtsmen concerning the position of a sailing vessel when laid to. The notion is abroad that they "breast" the combers while the truth is that they lie very nearly broadside to the sea, forging ahead about a couple of knots an hour; and this is as true of the sailing ship as of the yacht, except that the former, loaded almost to the deck, is swept by every heavy sea, which the yacht's buoyancy keeps her clear of. Only steamers head the gale when lying to.

One of the greatest misfortunes in the whole matter of this ocean race was that not a single naval architect of recognized ability crossed in one of the contestants. The excuse that they were too busy ought not to have prevailed in the face of the enormous amount of information they would have acquired on the passage, and in no other way. Watching the performance of one of his creations in a breeze of wind on the quiet Sound, or even along shore, gives a designer no idea of how she behaves in a heavy sea more than a thousand miles from land, particularly in the matter of running and standing gear. No sailing yacht ever goes to sea in an easterly gale, which is the only possible condition under which, near land, the strains of a vigorous sea on hull and spars could be observed by the designer or naval architect; if he could but have been persuaded to cross in this race, he would have observed the countless points, great and small, that otherwise he would never see. No designer who had been there before would have sent Ailsa to sea with so preposterous a square foresail and yard. The trysail was the perfection of what such a piece of canvas should be—heavy boltrope, massive cringles and gear in general able to withstand the wear of the sea. But the square foresail was hardly fit for a joke. The quality was all there, but the size and shape of it would have been laughable if the conditions had not been serious. The business of such a foresail is to enable a vessel to keep ahead of a heavy, breaking sea when running, and ought to be nearly if not quite as long on the foot as on the head, to lift her over the seas and prevent burying when hustled on by the crest; instead of which we tottered along beneath a squaresail cut so nearly to a point on the foot that it looked like an inverted isosceles triangle. Had we possessed a squaresail commensurate with the size of the boat we might have even made a show of running out the breeze of wind and finishing fourth or fifth instead of eighth. As for the yard on which this fragment was stretched, it must have been conceived for a seventy-footer to use off the Hook in August.

Concerning the yawl rig, it is our opinion that it is the most over-estimated one that appears in all the seven seas for any purpose except that of the British fishermen, and even they have rejected it almost entirely for the lugger and ketch. Many yachtsmen speak of the yawl rig as the very essence of everything desirable for a sea-going vessel; in their eyes it seems to have almost preternatural gifts in heavy weather; when Herculean tasks abound there is nothing to compare with it. "John is going up to Nova Scotia this fall," they say, "but then he's got a yawl rig, you know." The naked truth about the yawl is that the rig in the first place breaks up the sail area and reduces it for racing purposes; and in the second place it does not seem to be of any use at sea. When running, the little fright in the stern is out of commission entirely, and when hove to it is a positive danger when set, for well-designed boats crave the wind anyhow, and if the jigger were carried when laid to the boat would come all the way around on the other tack and create incredible confusion; and in moderate weather, close-hauled, a cutter will outpoint and outfoot any yawl of her size ever built. The proposition that a yawl heaves to at sea under head sails and jigger is a mere myth. As for the jigger's shortening up the main boom so that it is lifted well clear of the seas, it is equally untrue, for the jigger mast's presence does not in our case take more than eight feet from the main boom, provided the latter were cut off level with taffrail, as of course it generally is for sea work. The Alice and Minerva are perfect illustrations of the fact that yachts as small as forty feet on the water line can cross the western ocean under sloop and cutter rig, without converting them into the ugly, useless and sluggish rig of the yawl.

The rest of our voyage lay in moderate weather with a long, rolling southwest swell, however, that kept us under the trysail much of the time, though we did ten knots right along with almost the steamer's regularity; and it was in this vicinity that we exhibited the peculiar spectacle of a yawl churning along under six canvas triangles; three head sails, trysail, jigger staysail and jigger. We made our best hourly run about this time too, thirteen knots in the sixty minutes, and passed the Lizard at about four-thirty on the morning of June first, fourteen days and eleven hours from Sandy Hook, beating the time made by other yawls, Vigilant and Navahoe, establishing a new trans-Atlantic record for this rig, and also beating the passages of Yampa, Coronet, Dauntless, and Ingomar. Although we arrived eighth out of eleven starters, we made an excellent showing for a smooth-water racing machine even in heavy seas, and our passage across ought to illustrate the fact that a racing "ninety" can be handled and sailed even in wild Atlantic weather. With this as an established fact it seems more lamentable than ever that the hulls of our crack racing craft should be so over-pressed with canvas that even the larger ones dare not face a twenty-mile easterly breeze and sea in our summer racing, lest they stretch their sails out of shape for the next race. That is, the very surface to which the motive power is applied must not be exposed to any but certain benign breezes, and that in smooth waters. A pity it certainly seems that we cannot arrive at a more moderate and reasonable sail plan, so that our racing yachts could exhibit their ability in strong winds and chop of a sea without the probability of maiming some feeble bit of timber. Perhaps, though, on the other hand, by virtue of their almost limitless experience in handling vessels in strong winds and freshening seas, the deep sagacity of our regatta committees is after all justified in calling off a race when some of the boats, having made an offing, are perceived to be in a state of unusual agitation. How can we maintain a defense in the presence of such godlike wisdom?

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While the steamer Empire City was bound for Conneaut and practically off Ashtabula harbor, a pipe burst in the firehold. Olof Olsen, of Sault Ste. Marie and Henry Olde, of Buffalo, were scalded. The steamer was drawn to Ashtabula at once, and the injured men taken to the hospital. They were terribly burned, however, and died shortly after reaching the hospital.

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The steamers C. A. Black and America collided in a heavy fog in St. Mary's river recently, but are not seriously damaged.

## WHY AID IS REQUIRED.

ARGUMENT FOR SUBSIDIES, BY IRVING N. BRANT, A COLLEGE STUDENT AT IOWA CITY, IOWA.

At a debate held recently between two literary societies composing the debating league of the Iowa University, the following speech was made by one of the contestants in favor of subsidies for American shipping in the foreign trade:

My colleague has told of the decline of the once powerful American merchant marine, and he has shown that a marine is absolutely essential to our prosperity. It is imperative as a means of national defense and is indispensable for the growth of our foreign markets. The steady decrease in our shipping for the past forty years is in itself sufficient evidence that the marine will never recover if left to itself. President Roosevelt recognizes this self evident fact. He has advocated government aid to the merchant marine in every message to congress. He appointed a commission to investigate the condition of the shipping industry, and after two years of research, the president's commission reported that we should establish a system of shipping subsidies.

A subsidy is a grant from the government to assist in the support of an enterprise deemed advantageous to the public. In the case of the shipping subsidy the men who receive aid are only incidentally benefited by it, the real benefit is to the public at large. We are confronted by this proposition. We have in the United States an immense amount of ready capital which would be turned into the shipping industry except for one thing: foreign ships, favored by labor conditions and built up by subsidies, operate so cheaply that we cannot compete without financial loss. The idea of the subsidy is that we equalize conditions, nothing more. When this is done the marine will begin to grow.

We intend to prove to you that subsidies will build up the marine, and we would cite you the results obtained in those countries where it has been given a fair trial. The Merchant Marine Commission in its report says: "There is not an important commercial route anywhere on which the remnant of our American ocean fleet does not meet the keen edge of subsidized and bountied foreign competition." Now, honorable judges, does it not follow that if foreign subsidies are driving American ships off the ocean, they are at the same time increasing the fleets of their own countries? What government aid has done for foreign shipping it will do for ours, and by adopting a subsidy policy we will simply be turning to our own use a weapon that is now used against us by all the great maritime nations of the earth.

Great Britain has a larger merchant marine than all other nations combined, and she has paid more in subsidies than all other countries, a total of over two hundred and fifty millions in the last half century. Most of this sum has been paid in what are termed mail subsidies, ostensibly paid for the carrying of the foreign mails. By their means steamship lines have been created running all over the world, and forming the basis of England's enormous marine.

The first British subsidy was granted in 1840, when Samuel Cunard built four trans-Atlantic steamships, receiving an annual subsidy of over $400,000, sum raised to $700.000 for the purpose of driving out of existence a competing American line, and it accomplished its purpose.

Then England concluded to get control of the oriental traffic. For this purpose an annual subsidy of $2,000.000 was granted to the Peninsular & Oriental. Do you believe this was as compensation for carrying the mails? Listen to this extract from the report of the postmaster general of England, for 1870: "By the terms of the contract concluded with the Peninsular & Oriental Steam Navigation Company, the subsidy to be paid the company is set down at £400,000 a year, with a stipulation that whenever the annual income of the company, from all sources, does not admit of the payment of a dividend of 8 per cent annually, the sum shall be increased by so much as is necessary to make up this amount." The same thing was done in South America, the West Indies and in South Africa. But nowhere is the British policy set forth more strikingly than in the case of a line from Canada to the orient. For many years the Canadian mails to Japan and China were carried by an American line, at an annual expense of only $19,000. In 1902 the British government took away that contract and gave it to a British company for $300,000 a year.

The general policy of Great Britain is well summed up by United States Consul General Mason in his special report to the government. He says: "Since the days when the United States subsidized the Collins line and Great Britain did the same for the Cunard. British exports have been carried to the remotest corners of the earth in steamers which received heavy mail subsidies from the national treasury. Although disguised as payments for postal services actually rendered, these grants have had, as they were intended to have, the effect of direct, regular and liberal government subsidies for the creation and maintenance of steamship lines in the interests of English commerce."

But you may say, these subsidies are granted only to fast steamers. What about the slow freighters and tramp vessels? The tramp fleet receives no subsidies, but it is indirectly the product of the subsidy system. In the first place, the immense ship yards necessary to build the subsidized steamers produced tramp vessels at such a low cost of construction that they could be operated unaided. Secondly, the thirty or more subsidized English lines own immense numbers of cargo carriers, which receive no direct aid, but in making up the accounts of the company the subsidy distributes itself over the whole number. The Peninsular & Oriental alone, with fourteen very heavily subsidized ocean liners, operates unsubsidized freight steamers equal to 65 per cent of the total steam tonnage of the United States.

About 1881 Germany became tired of paying tribute to England in the way of freight charges, and Bismarck persuaded the government to adopt a system of shipping subsidies. The first subsidy was granted in 1884, and no more remarkable tribute can be paid to the success of the policy we advocate than to look at the progress of the German merchant marine since that date. For ten years it had stood stationary at one million tons; it is now over three and one-half millions, four times as great as that of the United States. Besides the subsidies, the government virtually gives a bounty on ship building by hauling at cost on the state railways all materials used in ship construction. J. Ellis Barber, an English shipping authority, says in the *Contemporary Review*: "The German ship building and shipping industry has been artificially created, fostered and developed until it has grown from a weak and artificial industry into a healthy, powerful and natural industry, which is able to maintain itself in free competition without state support against all comers."

Even the French, who have no natural liking for salt water and who have shown the most wonderful stupidity in framing a subsidy law, have by its means nearly doubled their merchant marine in twenty years. The first speaker for the negative spent a great deal of his time belaboring French subsidies, and he told you that instead of increasing the marine had declined 1 per cent since 1880, but the records show that it has increased from 900,000 tons to 1,350,000. We have no defense to make of the form of the French law; it is clumsy and uneconomical, but it has increased

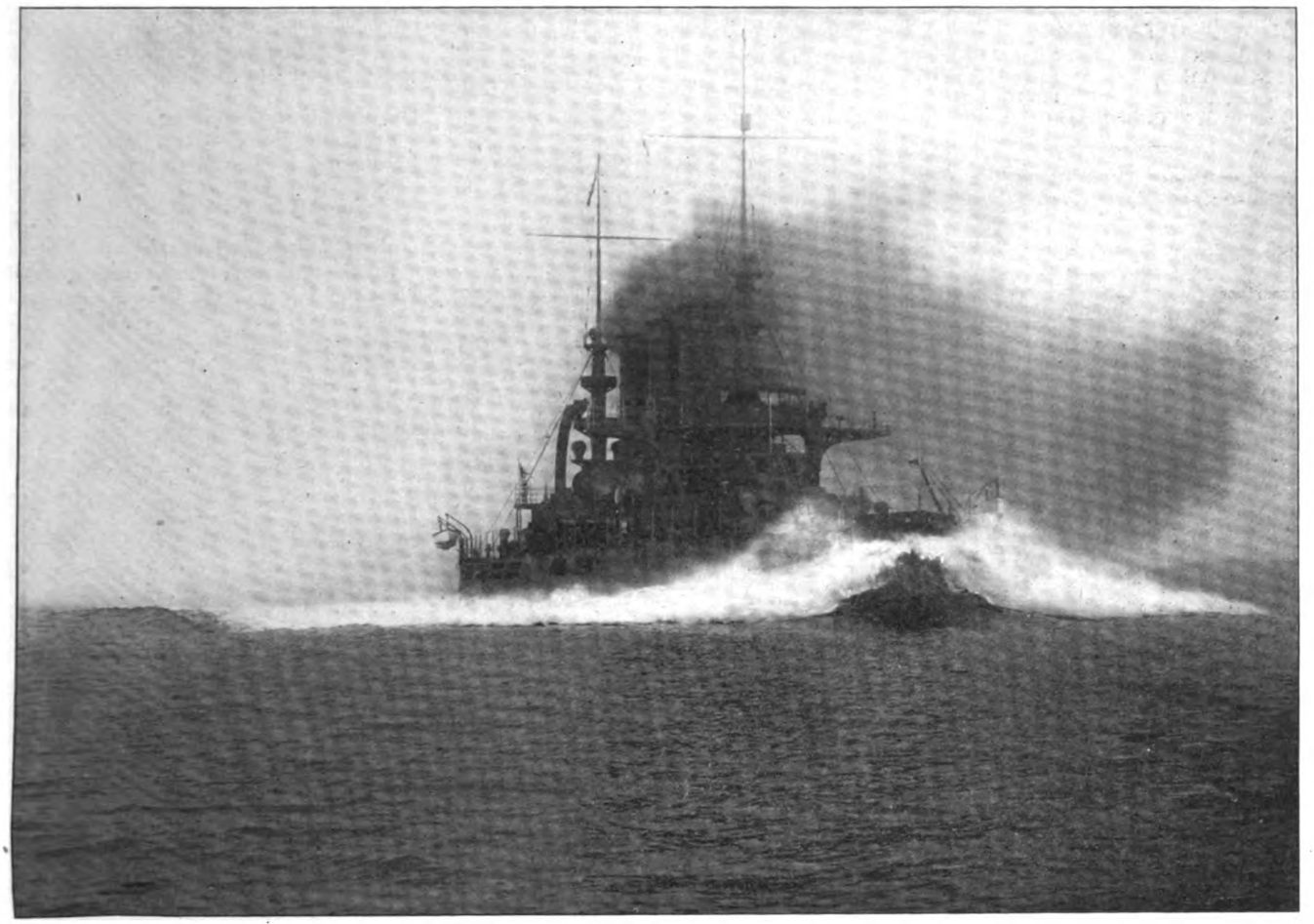
the French marine, and if the French can do this with a faulty law, what cannot the United States do, with a good law, coupled with our historic knowledge of maritime affairs?

Within the last decade, a new star has arisen in the east. Japan has perhaps the most carefully thought out system of shipping subsidies of any nation in existence. In 1894, Japan had only 200,000 tons of old fashioned sailing ships. In twelve years she has built up a marine of modern steamers of six times that tonnage, and every ship has been the recipient of a subsidy. President Roosevelt had Japan in mind when he said in his last message to congress, "Even on the Pacific, our merchant flag is now threatened through the liberal aid bestowed by other governments on their own steam lines."

While the United States has granted subsidies at various times, there was only one period when it could be said we had a subsidy system. This was from 1847 to 1856, when a little less than $2,000,000 annually was appropriated for the encouragement of steam vessels. Under this stimulus, our steam tonnage increased from 5,000 tons in 1847 to 115.000 in 1855. But sectional jealousy caused the subsidies to be withdrawn before our supremacy could be established, and in three years there was not a single American merchant steamer on the north Atlantic. Our opponents have talked at great length on the Collins subsidy, saying that it was the cause of the company's failure. It was not the subsidy that killed the Collins line, it was the withdrawal of the subsidy at the very time that the company had suffered a terrible loss in the destruction of its two best ships through unavoidable accidents at sea. All authorities agree that the Collins ships were the finest afloat, they held the trans-Atlantic record, and were fast regaining American supremacy in the European carrying trade when the company was ruined through the short-sighted policy of the United States government.

The cost of the subsidy is as nothing compared to the good to be derived. For every dollar expended five dollars will come back into the hands of the American sailors, mechanics and farmers. Not a cent will be spent until the ships are built and running, thus there can be no waste of funds while waiting for the subsidy to take effect. The amount to be paid will not run high. Assuming that the rates of compensation allowed in the bill now before congress are adequate and just, it would take 300 years to equal what we have spent on our army and navy since the close of the Spanish war.

The economic conditions which confront us are exactly those which faced Germany when England was undisputed in her supremacy, and we can overcome them in the same way Germany has. The fact that American subsidies have caused the construction of 177,000 steam tonnage since 1901 shows that they will increase our shipping. Then what consideration should prevent our applying in an adequate degree a policy which is sanctioned by precedent and which at a trifling cost will enable our merchant marine to come into its own?



BATTLESHIP NEBRASKA ON HER SPEED TRIAL.

*Built by Moran Brothers Co., Seattle, Wash.* *Photo copyrighted 1906 by W. P. Romans*

## BATTLESHIP NEBRASKA'S TRIAL.

The battleship Nebraska, built by Moran Bros. Co., Seattle, Wash., underwent her standardization trial July 16. The official mile made by Nebraska was 19.51 knots. The average for the first five runs on full power was 19.237 knots. The maximum number of revolutions per minute to produce top speed was 125.37. The number of revolutions at other rates of speed was 122.41. The test of the Nebraska was gratifying in every way to the Moran Bros. Co.

THE MARINE REVIEW

DEVOTED TO EVERYTHING AND EVERY INTEREST CONNECTED OR ASSOCIATED WITH MARINE MATTERS ON THE FACE OF THE EARTH.

Published every Thursday by

The Penton Publishing Co.

CLEVELAND.

BOSTON NEW YORK
DULUTH PHILADELPHIA
CHICAGO PITTSBURG
CINCINNATI

*Correspondence on Marine Engineering, Ship Building and Shipping Subjects Solicited.*

Subscription, $3.00 per annum. To Foreign Countries. $4.50.
Subscribers can have addresses changed at will.

Change of advertising copy must reach this office on Thursday preceding date of publication.

The Cleveland News Co. will supply the trade with the MARINE REVIEW through the regular channels of the American News Co.

European Agents, The International News Company, Breams Building, Chancery Lane, London, E. C. England.

Entered at the Post Office at Cleveland, Ohio, as Second Class Matter.

AUGUST 30, 1906.

## GREAT STEAMERS.

To show what a couple of years may bring forth, there is appended herewith the list of vessels 500 ft. and over which have been built or are under order to be built since the Wolvin was launched on April 9, 1904. Probably the steamer Sahara should be added to the list because her carrying capacity is practically that of a 500-footer. She, however, is not quite 500 ft. over all, being 494 ft. and for that reason is omitted. Contracts for steamers less than 500 ft. during the past two years have not been numerous. A few, however, have been built. Up to the time that the Wolvin was launched there was no vessel of 500 ft. dimensions on the lakes. There were four which approached that dimension so nearly as to be called 500-footers. They were the J. J. Hill, John W. Gates, Wm. Edenborn and Isaac L. Ellwood. These steamers were 498 ft. over all. The 500-ft. steamer is roughly classed as an 8,000-ton carrier. When favored with draught, however, she carries about 8,500 tons. The list herewith probably offers convincing proof that 500 ft. will be the minimum length of future steamers. This length makes a capacious and handy craft. When the Wolvin was launched no one could have foretold this wonderful development of lake ship building. In fact when she was launched it was freely declared that she would prove a financial failure. The fact that she has now so many sisters proves that she was a fine financial success from the start. Following is the list:

| Name | Length over all, ft. | Keel, ft. |
|---|---|---|
| Augustus B. Wolvin | 560 | 540 |
| Ball Bros. | 500 | 480 |
| Jas. C. Wallace | 552 | 532 |
| S. M. Clement | 500 | 480 |
| Philip Minch | 500 | 480 |
| Amasa Stone | 548 | 525 |
| L. C. Smith | 545 | 525 |
| Sylvania | 524 | 504 |
| Socapa | 524 | 504 |
| W. A. Rogers | 545 | 525 |
| L. C. Hanna | 524 | 504 |
| Powell Stackhouse | 524 | 504 |
| W. A. Paine | 500 | 480 |
| E. H. Gary | 569 | 549 |
| Wm. E. Corey | 569 | 549 |
| Geo. W. Perkins | 569 | 549 |
| H. C. Frick | 569 | 549 |
| J. E. Davidson | 524 | 504 |
| Hoover & Mason | 524 | 504 |
| W. G. Mather | 531 | 511 |
| Peter White | 524 | 504 |
| Jas. P. Walsh | 500 | 480 |
| John Stanton | 524 | 504 |
| Chas. S. Hebard | 524 | 504 |
| J. G. Butler Jr. | 545 | 525 |
| Joseph Sellwood | 545 | 525 |
| Loftus Cuddy | 545 | 525 |
| Jas. B. Wood | 534 | 514 |
| John Sherwin | 534 | 514 |
| W. K. Bixby | 500 | 480 |
| E. D. Carter | 524 | 504 |
| D. Z. Norton | 500 | 480 |
| B. F. Jones | 550 | 530 |
| Jas. Laughlin | 550 | 530 |
| Frank C. Ball | 550 | 530 |
| W. P. Snyder | 550 | 530 |
| Jas. P. Walsh | 500 | 480 |
| Eugene Zimmerman | 505 | 485 |
| Harvey D. Goulder | 545 | 525 |
| Harry Coulby | 569 | 549 |
| Abraham Stearn | 545 | 525 |
| E. J. Earling | 545 | 525 |
| C. A. Weston | 569 | 549 |
| Sir. Thos. Shaughnessy | 500 | 480 |
| J. Pierpont Morgan | 600 | 580 |
| Henry H. Rogers | 600 | 580 |
| Norman B. Ream | 600 | 580 |
| P. A. B. Widner | 600 | 580 |
| J. Q. Riddle | 552 | 532 |
| Henry A. Hawgood | 545 | 525 |
| Samuel Mather | 550 | 530 |
| Ishpeming | 550 | 530 |
| Michigan | 550 | 530 |
| J. H. Sheadle | 550 | 530 |
| D. J. Morrell | 602 | 582 |
| E. G. Townsend | 602 | 582 |
| Henry B. Smith | 552 | 532 |
| W. M. Mills | 605 | 585 |
| Legrand S. DeGrath | 605 | 585 |
| W. D. Kerr | 605 | 585 |
| Un-named for Charles S. Hutchinson | 552 | 532 |
| Un-named for John Mitchell | 552 | 532 |
| Un-named for Henry Steinbrenner | 552 | 532 |
| Un-named for J. C. Gilchrist | 540 | 520 |
| Un-named for J. C. Gilchrist | 540 | 520 |
| Un-named for W. A. & A. H. Hawgood | 552 | 532 |
| Un-named for E. D. Carter | 524 | 504 |
| Un-named for Pittsburgh Steamship Co. | 600 | 580 |
| Un-named for Pittsburgh Steamship Co. | 600 | 580 |
| Un-named for Pittsburgh Steamship Co. | 600 | 580 |
| Un-named for Pittsburgh Steamship Co. | 600 | 580 |
| Un-named for C. O. Jenkins | 524 | 504 |
| Un-named for Pickands, Mather & Co. | 552 | 532 |
| Un-named for Pickands, Mather & Co. | 552 | 532 |
| Un-named for Acme Steamship Co. | 552 | 532 |
| Un-named for W. P. Snyder | 574 | 554 |
| Un-named for James Davidson & H. L. Shaw | 524 | 504 |
| Un-named for W. A. & A. H. Hawgood | 552 | 532 |

## MEN ABOARD SHIP.

The attention of men aboard ship is respectfully drawn to the various competitive courses now running in the MARINE REVIEW. It is not too late for anyone to enter the competition for the prizes that are offered. These prizes are to be awarded to the four holding the highest percentages in the sums of $50, $25, $15 and $10 respectively. The questions will run weekly for a considerable length of time and ample time will be given everyone to study the questions and answer them. In other words it is not necessary to send in replies weekly. They may be withheld until the close of the season if necessary. So long as it is possible to do so, the MARINE REVIEW will send back numbers to subscribers. Great interest is noted in the contest and in the very instructive and excellent series of lessons now running in the REVIEW by Mr. Clarence E. Long. It should be stated that the prizes offered are merely an incident

to instill interest. The real purpose of the various courses is to prepare the younger element aboard ship for advancement.

## PASSING SIGNALS.

While the Tashmoo was coming down through Lake St. Clair last Sunday evening, she was compelled to blow passing signals three times before obtaining an answer from a northbound bulk freighter. It was impossible in the darkness to distinguish the name of the offending steamer, though undoubtedly a little persistent inquiry could establish her identity. As the channel is restricted the two steamers were compelled to pass quite close to each other. It would appear as though the promptest sort of attention should be given to passing signals from passenger steamers. There was probably little or no element of danger in the passing of the Tashmoo and the unknown steamer; nevertheless the Tashmoo had several thousand persons aboard and had a grave moral, as well as a legal, right to have the freighter declare herself.

## AT THE HEAD OF THE LAKES.

Duluth, Aug. 27, 1906.—The past week has been a dangerous one to navigation on Lake Superior because of the thickness of the atmosphere due to both smoke and fog and traffic has not only been slower but many narrow escapes have occurred. One serious accident took place when the steamer Frank H. Peavey, Capt. A. G. Tappan, went on the rocks about half way between the Lafayette and Edenborn wrecks, 12 miles northeast of Two Harbors. It has been difficult to account for the stranding as the weather was not bad on the night of the 20th, and the boat was steering a good course for Two Harbors, but it is believed that some atmospheric influence was operative for several boats came in above Two Harbors, unknowingly in the dark, about the same time. The steamer struck bow on and was pulled off in a couple of days when the sea had moderated a little with no great difficulty, whence it proceeded to Duluth where it was put into dry dock at the Superior Ship Building Co.'s yards. There it was found the that the bow stem down near the forefoot was broken in two places and from 20 to 30 plates damaged. Most of the plates were small the damage extending back only to the collision bulkhead. The stem is to be welded together and in two weeks it is expected the boat will be sailing again.

What is claimed as another evidence of the faulty condition of the Duluth harbor was the accident to the Mariposa last week when she collided with the Northern Pacific dock No. 4. The Mariposa towing the barge Holley, both loaded with coal, was trying to make the slip and it is claimed the sea rolling in through the canal threw her over against the dock damaging it considerably. The Mariposa had several plates bent as the result of the barge running into her when she struck.

The freight handlers' strike, which was inaugurated at the beginning of last week has embarrassed the handling of cargoes to a degree. About 350 men are out, but some have been obtained to take their places. There is no immediate prospect of a settlement, matters standing at present in the usual condition where both sides are getting along nicely and expect to win out. President Keefe has left Detroit for Duluth to see what can be done toward bringing about an adjustment of the men's demands which are for 35 cents an hour and a recognition of the union.

Major Charles Fox has arrived in Duluth to superintend the marking of the course through the interstate bridge where the span of the wrecked bridge was removed. Three black spar buoys have been placed on the south side of the channel and two red spar and two black spar buoys have been located on the north side. Buoy lights have also been placed near Cut Off channel above Grasy Point which is the channel around the east side of Big island. A red spar buoy has also been set on the outer end of the submerged breakwater which extends into the lake from near the foot of First avenue east. Major Fox is the government lighthouse engineer for this district.

Major Fitch, engineer in charge at this station, has appointed H. C. Bellinger harbor master. Mr. Bellinger resumes the duties of this position after an interval of thirteen years since he vacated it. Such inspection as this office provides for is very necessary in a harbor as big as the Duluth-Superior port and especially where it is put to such a variety of uses.

Coal shipments are somewhat lighter for the past ten days than just previous to that time, but the movement of ore from the three ports at the head of the lakes, for the week Aug. 14 to Aug. 21, was about 75,000 tons better than the preceding seven days and about equal to the average shipment during the season for a week. It was much behind the records of the later weeks however. To move the immense quantities of ore that were in men's ideas at the beginning of the season requires an equally immense system and one capable in every department of both transportation and management of dealing with the whole tonnage. The indications are that while bad weather and accidents have been blamed from time to time the general run of circumstances have been far from unusual and the retarding influences no greater than the average. The falling off from predictions cannot be laid to anything but the lack of capacity in the great system for moving the ore. The total shipments at the end of the season will represent the maximum output physically possible with the present shipping facilities.

The figures for the seven days from the 14th to the 21st are as follows: Two Harbors, 265,853 tons; Duluth, 385,530 tons; and Superior, 194,918 tons, a total of 846,301 tons. In 1905 there were shipped during the corresponding week from Two Harbors, 261,988 tons; from Duluth, 293,056 tons; and from Superior, 116,309 tons, in all 671,355 tons or 174,946 tons less than this year, Superior falling down badly. The total for this year from the Mesabi and Vermillion ranges up to Aug. 21 is therefore 13,933,168 tons, as compared with 12,615,095 tons last year, a difference of 1,318,073 tons.

The movement of grain has been the lightest during the week under review that it has been all summer, only 754,934 bus. in all being shipped. Receipts of grains also fell off and interest is altogether in fall wheat. The receipts and shipments of the past fourteen days appear in comparison, as follows:

| | Receipts | | Shipments | |
|---|---|---|---|---|
| | Aug. 18. | Aug. 25 | Aug. 18. | Aug. 25 |
| Wheat | 128,067 | 98,430 | 832,725 | 264,246 |
| Corn | 661 | 707 | ..... | ..... |
| Oats | 49,934 | 70,383 | 125,862 | 182,108 |
| Barley | 74,091 | 96,781 | 289,488 | 62,157 |
| Rye | 9,723 | 13,259 | 25,000 | ..... |
| Flaxseed | 135,472 | 98,983 | 548,804 | 246,423 |

The following bids were recently received by the treasury department for the construction of a 50-ft. launch for use at Norfolk, Va.; Hampton Roads Boat Building Co., Newport News, Va., $4,656; Chesapeake Launch & Motor Co., Norfolk, Va., $5,520; Lumley-Dodson Co., Norfolk, Va., $4,948; C. Dunn & Son, Baltimore, Md., $4,763.38.

## AROUND THE GREAT LAKES.

John W. Preston, a veteran lake master, died at Buffalo last week. He was eighty years old.

The Upper Mississippi River Improvement Association will hold a congress in Minneapolis on Oct. 9 and 10.

Capt. Martin Swain, of Detroit, who has been very ill for some weeks past at Harper hospital, has now been removed to his home.

Ad. Weddow has been appointed superintendent of the coal docks of the Pittsburg Coal Co. on the Erie railway at Cleveland.

The steamer Venezuela, owned by Capt. Jas. Davidson, has been placed in his dry dock for extensive repairs, including wider hatches.

Jas. Rabbitt, of M. Rabbitt & Sons, contractors, says that the Duluth canal at St. Clair Flats will be opened to navigation about Sept. 1.

The steamer Wm. A. Rogers went ashore on Long Point last week, but was released after 500 tons of her ore cargo had been lightered.

Several blades were broken off the steamer Pontiac in Ashtabula harbor recently. The steamer was towed by the tug Oscar C. Stedman and placed in dry dock.

Capt. Walter H. Solmes, master of the steamer Chippewa, died at Toronto last week. He had been in the employ of the Niagara Nav. Co. for the last sixteen years.

While entering St. Clair river at Port Huron, the steamer City of Concord became disabled by fouling her tow line, allowing her consort Argonaut to run aground at the lighthouse.

The tug Frank C. Barnes of Duluth, owned by L. R. Martin and Oscar Olson, was sold recently to the Thunder Bay Contracting Co., operating at Port Arthur. The consideration was $2,000.

The tug Sea Wing, owned by the Huron Fish Co., ran aground on the Kenosha reef at North Point this week. It was later released by the crew of the life saving station at Thunder bay.

The citizens of Sault Ste. Marie tendered a farewell dinner recently to Joseph Ripley, who has just left the Sault to superintend the construction of the locks of the Panama canal.

The Mesabi Steamship line has increased its capital stock from $470,000 to $940,000. The company owns the steamer Samuel Mather and has just given orders for two additional steamers.

Capt. Geo. Robarge, master of the steamer Harvey D. Goulder, will bring out the steamer Henry A. Hawgood, which will be launched at the yards of the American Ship Building Co., Cleveland.

The steamer Case, which was damaged at Port Washington last week, has been placed in dry dock at Milwaukee. Capt. J. L. Weeks, superintendent of the Gilchrist fleet, will look after her repairs.

The work of raising the steamer Linden, which has been on the bottom of the St. Clair, has been temporarily suspended by the McMorran Wrecking Co., while it raises the sunk dredge off Dunkirk.

In deepening the slip at the Salt dock at Waukegan, Wis., the sand has run under the docks and the railroad tracks, entailing a heavy loss. The tracks have caved in and the docks have been undermined.

Frank L. Fairbank, second mate on the steamer Frank Rockefeller with Capt. McLeod, was formerly working in the same capacity on the steamer James B. Colgate. He hails from down New York state.

Capt. J. C. Newman, one of the early settlers of Chicago and a lake master of wide and varied experience, died last week. At one time he was the owner of the Montgomery line of freight and passenger steamers.

Capt. Ed. Whitney, of the steamer Ericsson, prides himself on the fact that he is skipper of the largest whaleback on the lakes. One of the distinguishing features of his boat is that the crew which fits her out, lays her up.

The Great Lakes Towing Co. is building a large tug at its yards on the Chicago river. The tug is 78 ft. long over all, 17 ft. beam and 11 ft. deep. The engines of the old tug A. G. Van Schaack will be installed in the new one.

Major Graham D. Fitch, government engineer in charge of the Duluth-Superior harbor, has appointed Mr. H. C. Bellinger of Duluth, harbor inspector. Mr. Bellinger was inspector of the harbor of Duluth thirteen years ago.

Capt. Jas. W. Robertson, veteran lake master, was burned to death in a fire which started on the top floor of the Buffalo Ship Chandlery & Supply Co., Main street, Buffalo, recently. Chas. Johnson, a sailmaker, was also fatally burned.

The steamer Frank H. Peavey was released from the north shore of Lake Superior on Thursday last and is in dry dock at Superior. She is not as badly damaged as was expected, and the repairs will be completed within a couple of weeks.

S. D. Graham, who is now chief engineer on the steamer Zenith City, was formerly second engineer on the same boat. His promotion came this year. He has been sailing for sixteen years, starting as an electrician on the D. & C. steamer City of Mackinac.

Capt. Murray McIntosh, who sailed the steamer Majestic several years, struck Ashtabula last week on his new command, the steamer Admiral. Capt. McIntosh's good record shows that shifting from a wooden to a steel boat is an easy matter.

Capt. Forest Maloney, who is skipper on the steamer E. C. Pope, is one of the youngest captains on the lakes. It was only a few years ago that he was knocking out experience as a watchman and later as a wheelsman. Capt. Maloney hails from Amherstburg, Ont.

Col. Davis, government engineer of Detroit, opened bids recently for dredging shoal 28 in Mud lake. The bidders were: Great Lakes Construction Co., 22½ cents per cu. yd.; Jas. Pryor, Houghton, 33½ cents; Great Lakes Dredge & Dock Co., 34½ cents.

Capt. Herbert W. Blend, of Muskegon, who was in the steamer Atlanta when it burned on Lake Michigan last winter, has just been able to return to the Goodrich fleet to take charge of the Cheboygan. He has been incapacitated by rheumatism since the fire.

While going into the harbor of Grand Marais with a boiler from the wrecked steamer Sitka, the tug Westcott dropped the boiler again in the center of the channel, just outside of the harbor entrance. In its present position it forms a menace to navigation.

The keeper of the Toledo harbor light station reports that the wreck of the steamer Lucille of Sandusky, lies sunk in about 25 feet of water about three and a half miles north of the Toledo lighthouse. Her smoke stack is about 4 ft. above water, and her hurricane deck is awash.

The fireman question is becoming a serious one at Ashtabula. Many of the big ore carriers and some of the medium-sized boats are being delayed and inconvenienced because of the engineers' inability to get firemen. As soon as a boat strikes port, many of them jump ashore. The men appear to be scarce.

There is a bad spot in the Lorain harbor at the Cleveland, Lorain & Wheeling ore dock. The normal stage of water in the channel is 19 ft.,

but with a south wind vessels drawing that cannot reach the dock. The shoal spot is between the car dumping machine and the piers.

Capt. Harris H. Baker, successfully raised the steamer C. W. Elphicke, stranded on the eastern breakwater of Cleveland recently, and after the remaining portion of its cargo was lightered upon the Magnetic, was towed to dry dock. The repairs upon her will take about six weeks.

The Pittsburg Steamship Co.'s boats are being rushed to the limit, many of them making four trips a month, but it happened recently at Ashtabula that the steamer Ericsson was delayed four days. When she did get away one of the men aboard declared he would paint her stack black on account of the delay.

Capt. L. B. Cummings, master of the steamer Anna C. Minch, is the envy of all the captains on the lakes on account of a swell-looking glass top he has had built on the Minch's pilot house. It is on the order of a shelter from the elements, but steam heat and other conveniences make it an extension of the pilot house proper.

Officials of the Pittsburg Steamship Co. do not claim to have any yachts in their big fleet, but it is a fact that Capt. F. C. Watson, of the steamer Maruba, made the residents of Ashtabula think last week that he is sailing a yacht. The Maruba looked nice enough in a new coat of red paint to be classed that way. Some said she is the "nicest looking boat in the fleet."

That it is natural for some families to take to the water, is indicated by the fact that there are three Girardins in skippers' berths. Capt. David Girardin sails the H. H. Brown, Capt. David Girardin Jr., sails the Fayette Brown and Capt. Walter Girardin sails the barge Hartnell. It is seldom that a father and his two sons sail three boats in one line.

The Union Wrecking Co. is raising the steamer John Duncan, which lies in fifty feet of water just off the dock at North Point. The Duncan was damaged in a collision with the Anchor liner Lehigh on Lake Michigan about two months ago, and went to the bottom soon after getting into North Point. The Duncan is owned by J. H. Pauley of Milwaukee.

On account of the car shortage, the steamer Queen City was held over Sunday at Ashtabula to the disappointment of the entire crew. It appears that she has been making the rivers every Sunday and this makes a break in such a good record. Capt. Geggenheimer, Fred Jones and L. O. Sturtridge are the master, mate and second mate of the Queen City.

Albert B. Bailey, second mate on the steamer Pathfinder, is one of a score or more young men who made the jump from a wheelsman's to a second mate's berth this year. Mr. Bailey is related to Capt. Al. Mahan, of the City of Bangor; Capt. Walter Mahan, of the Tom Adams, and Joe Mahan, mate of the Edwin F. Holmes. Sailing the lakes comes natural for all four.

Assistant U. S. Engineer Howard E. Smith has planned to go out from Ashtabula this week in the tug Ariel to search for a sunken crib, reported by the steamer Helena, sixteen miles off the harbor. Mr. Smith will be accompanied by T. C. Frame, Tom Hanrihan, James and Chauncey Goldsmith and O. C. Jones. The Ariel was recently fitted out with a new compass.

Captain James Reid of Sarnia, who had the contract for raising her has floated the Monkshaven. The Monkshaven was driven ashore at Pie Island in Thunder Bay in the storm of last November while on her way to load grain at Port Arthur and it was thought at one time that she had been injured beyond any hope of saving her. The wreck will probably be brought to the head of the lakes for repairs.

Col. C. E. L. B. Davis, United States government engineer, Detroit, has been advised from Washington not to close the contract for widening the canal at the Soo until the department of justice passes upon the legal technicalities in the case. This probably means the passing by the department of justice upon the recent grant of land to the government by the Chandler-Dunbar Co.

Capt. C. C. Allen, one of the best known masters on the lakes, died at his home in Cleveland last week. Capt. Allen was born at Amherstburg fifty-nine years ago, and has followed the lakes since boyhood. He had been in the employ of Harvey H. Brown for the past thirty-two years. He brought the steamer Cascader out in 1890, and sailed her until his retirement two years ago.

The steamer D. J. Morrell, built for the Cambria Steel Co., was launched from the Bay City yard of the American Ship Building Co., and was named by Mrs. Frank Jeffrey, wife of the general superintendent of the yard. The Morrell is a duplicate of the Townsend, launched at Superior last week, and is 602 feet over all, 582-ft. keel, 58-ft. beam and 32 ft. deep. She will be commanded by Capt. P. L. Millen.

Most of the skippers on the lakes have some particular pleasure they like to revert to best. Capt. David Girardin, of the steamer Harvey H. Brown, is one of them. When he strikes home after laying his boat up, he does not wait to get his grip unpacked before he takes his gun and goes hunting. If there is anything he likes best, it is a muskrat or a "blue bill." Capt. Dave, who is commodore of the N. W. T. Co.'s fleet, lives at Amherstburg, Ont.

Some of the lake captains have been discussing record-breaking trips lately. According to one animated discussion, Capt. John Noble, who now sails the Maritana, took the steamer Cort from Ashtabula to Ashland to Fairport, towing the barge Malta in six days 20 hours and 20 minutes. It is said he would have done better if the elements had not conspired against him. This record was made last year.

The wooden package freighter Gov. Smith, owned by the Rutland Transit Co., was sunk in collision with the Gilchrist steamer Uranus eight miles off Pointe Aux Barques in Lake Huron. The Smith was bound down with a cargo of merchandise. So quickly did the Smith sink that the crew had barely time to scramble on board the Uranus. Her cargo was valuable and the loss was therefore great. The Smith was built by the Detroit Dry Dock Co. in 1889 and was 240 ft. keel and 42 ft. beam.

It is announced that the Detroit & Cleveland line will place the steamer City of Cleveland on the Mackinac run next season, when the new passenger steamer, now building at the Wyandotte yard of the American Ship Building Co., comes out. During the winter the City of Cleveland will be completely overhauled and operated as an express steamer from Cleveland to Mackinac. It will only stop at Detroit and Alpena en route. This will place the Mackinac service on a far more practical basis for Clevelanders than formerly.

Of all the fleets on the lakes, it is doubtful if there are any which can equal the record of the North Western Transportation Co. as training ships for the rising generation of sailors. Most of the boats have been sailed by men from Amherstburg, Ont., otherwise known to sailors as "Malden, Mich," and it is a fact that at least fifty captains on the lakes got their start out of Amherstburg on such boats as the Forest City and R. J. Hackett. Both of these boats

are gone, the Hackett burning to the water's edge on Lake Michigan last fall.

While attempting to enter the harbor of Charlevoix this week, the passenger steamer Illinois of the Northern Michigan Transportation Co.'s fleet, went on the beach 200 ft. south of the pier. Although a high sea was running, the life-saving crew succeeded in rescuing the 150 passengers with a life boat and breeches buoys. The accident was caused by the action of the master of a schooner in attempting to enter the piers by running across the bows of the Illinois, forcing the steamer out of its course to avoid a collision. The wrecker Favorite was sent to her release.

Capt. Robarge, of the steamer Harvey D. Goulder, anxiously watched the movements of the contractors, moving the span of the Duluth bridge, while his boat was waiting to go through for a load of ore. The captain had his coat off on account of the intense heat and hundreds of onlookers, who thought he was the whole works, asked him many foolish questions, of what he intended to do about this and that, when boats could get through, etc., etc. It was extremely amusing to listen to his quick replies. At times he would say he intended to have the big steamer Goulder get her nose under it and lift it over on the dock, and all went away as well satisfied as if a complete typewritten statement of the work to be done, was handed them.

In the blow on Lake Erie Sunday night last, the steamer Rhoda Stewart lost her two barges Wm. Grandy and Agnes Potter off Euclid Beach by the breaking of the tow line. The steamer with her consorts was en route from Kelley's Island to Ashtabula with stone. In the high sea running the cargo listed and the unequal strain caused the tow line to part. Both vessels immediately drifted to the beach. The list on the Potter was so great that the cook stove overturned and the vessel caught fire. Capt. Frank Jennings ordered the yawl launched and with Mrs. Julia Vance, the cook, and the three deck hands, Hugh Rorarty, C. McAllister and Iva Colio, rowed to the breakwater. Capt. Jas. Galvin also ordered the yawl of the Grandy launched and started for the shore with the cook and two deck hands. Their yawl was capsized in the surf, but they were able to wade ashore. The steamer ran into the breakwater and tugs were sent out to bring the Grandy into port. The vessels are owned by the L. P. & J. A. Smith Co., of Cleveland.

## OBITUARY.

Mr. Jay C. Morse, who died at his home in Cleveland on Aug. 22, though not exactly a pioneer, was nevertheless one of the early and prominent figures in the development of the Lake Superior iron country. He went to the Marquette range in the early seventies as the agent of the Cleveland Iron Mining Co., the first company to ship ore from the Lake Superior region. Mr. Morse continued as a representative of the company at Ishpeming for a number of years, returning to Cleveland as vice president of the company in 1882. Later he aided in the organization of the firm of Pickands, Mather & Co. In 1885 he was elected president of the Union Iron Co., of Chicago, which afterwards consolidated with the North Chicago Rolling Mill Co. and the Joliet Steel Co. which concerns later became known as the Illinois Steel Co. He was president of the Illinois Steel Co. until succeeded by John W. Gates. Mr. Morse was also president for a time of the Minnesota Iron Co. and helped to organize the Minnesota Steamship Co. He retired from active business life in 1895, though continued his association as director of various enterprises. Some years after the death of Col. Pickands, Mr. Morse married Mrs. Pickands, the widow of his former partner. She is a sister of the late Senator Hanna. During recent years Mr. Morse spent a considerable part of his time at Thomasville, Ga.

JAY C. MORSE

Mr. James Dredge, editor of *Engineering*, London, the foremost technical publication in the world, died Aug. 16. Mr. Dredge had been ill for a long time and had vainly endeavored to recuperate his health by periods of rest in Italy. He was an especially broad-minded man of charming personality and was greatly interested in the engineering and industrial development of the United States. He had visited this country on several occasions, having been royal commissioner to the Centennial exposition in 1876 and to the Chicago world's fair in 1893.

Wm. Imrie, one of the founders of the White Star line, died in Liverpool, Aug. 7, leaving an estate of $1,500,000 to Liverpool charities, to be distributed mainly among shipping societies.

## NAVIGATING IN ST. MARY'S RIVER.

Lawrence O. Murray, assistant secretary of the department of commerce and labor, has written the following letter, which is self-explanatory, to Lieut. C. E. Johnston, commanding the United States steamer Mackinac, St. Mary's river.

Replying to your letter of the 19th instant: Rule XIX, of the rules and regulations governing the movements and anchorage of vessels in the St. Mary's river (Jan. 22, 1901), is hereby amended to read:

Rule XIX. Whenever at Johnston's Point, Sailors' Encampment, a red ball under a white ball by day or two red lights under a white light by night shall be displayed to indicate that a steamer with a tow is bound down, a steamer bound up below Johnston's Point shall navigate with caution.

## FREIGHT SITUATION.

The ore movement is very heavy and vessels are pushed to the limit. Strenuous efforts are being made to get as many boats away from Lake Erie docks as possible by Saturday to avoid the double holiday. The car shortage however, is lessening the efficiency of the docks. Coal is moving freely and while rates are unchanged, a premium is being paid to some of the slower docks on Lake Michigan. There is no change in Lake Superior rate. The grain trade is slow and the rate has consequently sagged.

Capt. S. A. Lyons, master of the steamer Michigan, has installed his charts and chart table in the forward crew's hallway. In this way, all in the forward end can receive benefit from referring to them.

Frank Peterson, who was mate on the City of Rome last season, is mate of the steamer Merida this year.

## ROYAL TIME ABOARD TIONESTA.

The wrecking of the drawbridge at the inner harbor of Duluth was one of the worst disasters which ever happened to navigation on the great lakes. The damage to the drawbridge was estimated at $250,000, the loss to the shipping interests aggregated twice as much more, and the indirect loss to mines and manufacturers reached far over the million mark, according to careful calculations of those in a position to make figures.

The passengers of the Tionesta endured their imprisonment in the harbor for three days with the utmost philosophy, though the weather was sweltering. The Pennsylvania Railroad Co. gave them a square deal, Capt. John Doherty was faithful and considerate and his courtesy was appreciated. A little leaven lightens the whole loaf, and so the genial spirit and disposition to make the best of the situation on the part of a few of the passengers soon spread to the whole ship load and the passengers had a rollicking good time while they were "bottled up" at the Superior docks.

When the blockade was lifted there was a never-to-be-forgotten scene. As the span of the bridge was raised on the pontoons and floated away behind the steam tugs, thus opening the passage for all vessels, the Tionesta's whistle gave a long joyous blast. This was promptly taken up by all the vessels in the harbors, the mills, the factories, the mines, and everything capable of making a noise, and for ten minutes there was a din the like of which Duluth never heard before. Thousands of eyes were directed to the moving span of the bridge and thousands of faces wore a smile. It was an inspiring moment, and it meant much to a great many persons who had large interests at stake. The Tionesta was the first vessel to pass the newly-made channel and she was lustily cheered as she majestically passed out and tied up to the Anchor line dock at Duluth.

On Wednesday afternoon, soon after the Tionesta had left Duluth, some of the passengers inveigled Capt. Doherty forward on the main deck, where there was singing and jollity unconfined. Mr. Arthur M. Roy, of Wellsboro, Pa., on behalf of the passengers, addressed the captain as follows:

"Ladies and gentlemen, fellow passengers:

"Clasped this beautiful summer day on the bosom of Superior, sailing to port with complete confidence in the skill of our captain as a navigator, we are passing the hours in sweetly restful dreams—all life's cares and sorrows pushed aside.

"We, the passengers on the staunch ship Tionesta, are of one mind and accord in expressing our appreciation of the ability of Capt. John Doherty as a man and a navigator. No better seaman holds the charts of the great lakes: no sounder judgment or cooler head in any emergency directs the course of a ship on these waters. A perfect personification of nature's nobleman is the master of the Tionesta, 'So say we all of us.'

"First Mate Grant is the biggest little man who stands on the bridge, and Second Mate Cotter's watchful eye seems to be everywhere. Purser Servoss is indeed a 'Sunny Jim' and his courtesy and good temper are uniform and continuous. The genial steward also wears a smile through adversity, and it is our conclusion that it requires genius to furnish 1,200 good meals a day, as he did on the up trip.

"We take pleasure in here giving voice to our appreciation of the courtesy of officers and crew, and their attentive care for our comfort during our whole voyage.

"Bottled up like Cervera, our enforced detention was not so unpleasant after all. Emerging from the blockade, no more dangerous things than egg-shells threatened us—and all fresh laid. The fleet outside was not in the least hostile.

"May this sublime day—this sunshine, these smooth waters, be indicative of the lives of passengers and crew, till we reach the harbor of eternity. Let the pure waters of Superior and the ozone we are so gratefully taking into our lungs this day, be symbols of our lives henceforth, always trusting in the Great Captain who made the heavens, the earth, the sea and all that in them is.

"The company is wise in its selection, and fortunate in the possession of such officers and crew. It needs no formal resolution for Captain Doherty to know how much we appreciate him as a man and a seaman. However, if you agree to the sentiments here expressed, 'pipe up' in vigorous tones to our captain 'aye, aye, sir!' "

The passengers shouted their endorsement of these sentiments most heartily. Capt. Doherty was surrounded and he had to shake hands all round before they would let him go. Every passenger personally thanked him for his kindness.

The captain is a very modest man, and he was greatly embarrassed over so much attention, but he seemed to feel that his passengers meant all they intended to convey by the demonstration. This splendid ovation given Captain Doherty doubtless far exceeded anything of the kind which has ever occurred upon the great lakes.

The degree of good spirit was not allowed to die out on the remainder of the trip. There was a minstrel entertainment in the parlor the same evening, with good music and some original and very pat jokes by the end men. A troup of Indians led by Chief C. A. Pickard of Jamestown, N. Y., won the good will of the passengers and crew, and stirred things up till Cleveland was reached. As the Tionesta was making her dock at Cleveland, and the passengers knew they were about to be transferred to the Juniata to finish the trip to Buffalo, they were still in good humor. The "Indians" from the main deck sang to the tune of Mr. Dooley and with spirit, the following impromptu song as they approached the dock:

Our Captain sailed a steamer, and she was a daisy, too;
He took us up to Mackinac, and also through the "Soo;"
We reached Duluth, and in the harbor had to hang about;
'Twas Captain Murray put us there, but Doherty brought us out.
Oh! Captain Doherty, Oh! Captain Doherty,
He's the greatest man the country ever knew;
He's diplomatic and democratic,
Oh! Captain Doherty, 'orty, 'orty, 'ooo.

Capt. Doherty probably never had a boat load of passengers leave him with greater feeling or so much regret as did these, after a trip of unusual good fellowship, an experience which might have been unpleasant had there been many kickers aboard, and weather which was ideal for a vacation trip on the lakes. The majority of the passengers resolved to meet again on board the same ship next season during the week nearest the middle of August.

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Arrangements are being made for a big river celebration to take place in Pittsburg some time in October. Within the next six weeks dam No. 2 in the Ohio river will be completed, and river men will celebrate the event. At the same time they will celebrate the passage of the Lake Erie and Ohio river ship canal bill. Committees from the Dravo Waterways' Association, Merchants and Manufacturers' Association and the Chamber of Commerce will have charge of the affair.

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At the annual meeting of the stockholders of the New York & Cuba Mail Steamship Co., the following officers were elected: President, Henry P. Booth; secretary, Alfred G. Smith. These with George E. Weed, Wm. Roland and John W. Imrie constitute the board of directors.

# SCIENTIFIC LAKE NAVIGATION

## By Clarence E. Long

### MAGNETISM BY PRACTICE AND EXPERIMENT.

EXPERIMENTS TO BE MADE BY THE STUDENT IN THE STUDY AND PRACTICE OF MAGNETISM.

In this lesson it is intended to lead students to acquire, by means of experiments, an elementary knowledge of magnetism. It seeks to bring directly under the student's observation the reality itself, thus training him to observe for himself, to reason for himself, to rely on himself, and to test the accuracy of his inferences and observations by new experiments, and by the comparison of his work with that of others.

The study of magnetism should be experimental. By no other method will the knowledge obtained be "real" knowledge; it will only be "hearsay" knowledge. The student should make it a point to put everything he learns into practice. This is of the utmost importance, and he will be exceedingly surprised how easily such knowledge will come to him. The knowledge of the subject which the student gains by experiment is a living knowledge, applicable in untold ways, which the discerning power of his training will always point out.

Magnetism constitutes a branch of physical science in which most of the experiments necessary to be made by the beginner are first, easily made; second, exceedingly interesting; third, inexpensive; fourth, easily to be made by the student without the aid of a teacher, and fifth, possible to be made with apparatus which the student can devise for himself.

The experiments described in these pages will most of them be such as will conform to the above statements.

In every case the experiments necessary to the understanding of the science will be described so simply and minutely that a student will be able to grasp their meaning even if he does not actually perform the experiment for himself.

The great rule to follow by the student is to begin at the beginning, to proceed slowly, and to do everything thoroughly that is done.

The only apparatus needed is two bar magnets, one, say 8 inches long, by ¾ inch wide and 3-16 inch thick, the other 6 inches long with the same width and thickness as the other; two knitting-needle magnets about four inches long. Temper and magnetize these and mark the ends red and blue as already described. Also some small pieces of soft iron of various lengths and sizes (different sizes of soft iron nails will do) and a small quantity of fine iron filings free from dirt. If dirty sift through a piece of muslin. This will constitute all that is necessary to start with.

INDUCED MAGNETISM.

Magnetism which has been induced in a piece of iron imparts a similar condition to a second piece in its vicinity, and that to a third, and so on, as seen in the accompanying illustration, which is called "magnetic chain." The student can readily see that attraction ensues between the several pieces, although with diminished energy, as they are more distant from the acting pole. Each separate piece is a magnet in itself, the pole of the iron next to the acting pole of the magnet being opposite to that pole of the acting magnet. To prove that the end of the magnetic chain contains north polarity, present this end to a suspended magnetic needle, and either attraction or repulsion will take place, depending, of course, to which pole of the magnet it was presented. If the south pole of the acting magnet were used, instead of the north pole, as in the above illustration, the conditions would be reversed; the piece of soft iron next to the acting pole would contain north polarity, as well as the top of each separate piece where it attached itself. The bottom end of the last piece would be a south pole.

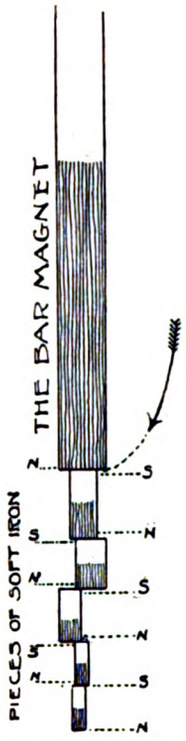



FIG. 17.

Magnetic Chain—formed by pieces of soft iron adhering to permanent bar magnet by inductive force. The arrow shows the north pole or end of the bar magnet, and also where the first piece of soft iron adheres and helps support the others. Color these as already described.

Another way of proving that the magnetism in soft iron is only transient, is by holding the acting bar magnet, in the foregoing illustration of a magnet chain, in the left hand and the top end of the piece of soft iron next to the magnet, indicated by the arrow, between the thumb and forefinger of the right hand, and then detach or separate the bar magnet from the several pieces of soft iron. As soon as the influencing magnet is removed the several pieces of soft iron will drop off from the piece of soft iron held between the thumb and forefinger. If it should happen that some of the pieces adhere to each other for some time after the influencing magnet has been removed it shows that the pieces of iron are not as soft as they should be, but that they are hard and have retained some of the magnetism imparted to them by the permanent magnet.

OTHER EFFECTS OF INDUCTION.

By the effects of induction it often occurs that repulsion is converted into attraction, that is, the like poles of any two magnets brought into contact with each other are, for the time being, converted into attraction. Take for instance the like poles of two magnets, which are very unequal in size or power, when brought near or are in contact with each other, the opposite polarity induced in the near end of the smaller, by the action of the pole of the larger, will, at a certain distance, just balance the similar polarity which it possesses; while within that distance, the induced polarity will exceed the other, and the resulting action will become attractive. Accordingly, when the pole of a strong magnet is presented to the similar pole of a weak one at a considerable distance, repulsion will take place.

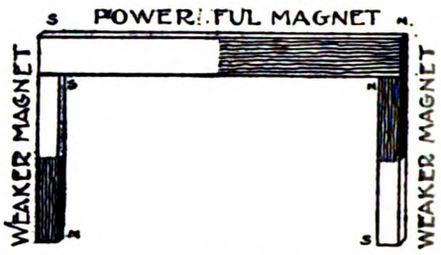



FIG. 18.

Showing repulsion converted into attraction by a large and powerful magnet over weaker ones. This is another peculiar, as well as interesting feature of magnetism. It must be remembered that although the magnet holds up, or sustains the weight of the smaller magnets by the attraction of like or similar poles, (this is not so, it only appears to be so) the weaker magnets, when removed, or taken away from the powerful magnet, return to the same state or condition they were in just previous to the time that the experiment was made; that is, they have lost none of their magnetism, and neither have their magnetic poles changed ends. When placed in contact with the powerful magnet, and so long as they remain in that position, the poles of the magnets are reversed, for we know that similar poles cannot attract or cause attraction. It is the stronger force of one kind of polarity that overcomes the weaker force of the same kind of polarity, and then induces, or imparts an opposite kind of polarity in the same pole, consequently attraction must take place; and as we have said before by inductive force attraction always takes place. The above facts must be thoroughly understood and remembered by the student for if it be not understood and it should occur in some of his experiments the student is liable to have his calculations knocked sky high.

As the interval between the poles is lessened, the polar force of the weaker magnets is gradually diminished, and at a certain distance there is no action. Within that distance the polar force changes sign, and the repulsion is converted into attraction. Thus it is that two magnets of unequal strength always

adhere when brought into contact by their similar poles.

When the pole of the inducing magnet is brought near the other portions of the iron bar, more complicated results fol-

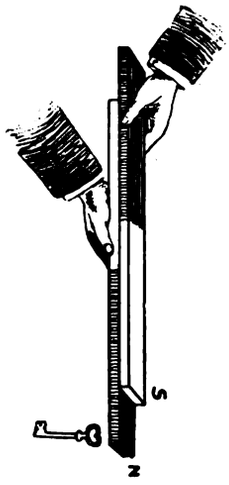



FIG. 19.

Showing the mutual action of two *dis*-similar poles in lessening the portative and attractive powers of magnets. Color.

low. Thus, if the magnet be made to touch the middle of the bar (instead of the end), their longer sides being at right angles, an opposite pole will be developed by induction at the point of contact, and similar poles at the two ends. If a circular plate of iron be laid horizontally and a bar magnet be al-

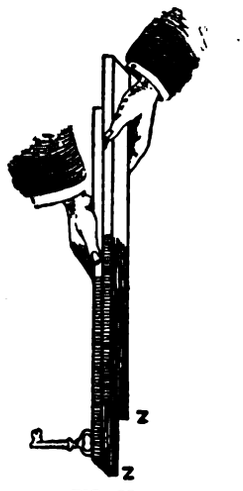



FIG. 20.

Showing the action of two similar poles in increasing the portative and attractive powers of magnets. Two south poles together would produce the same effect. Color.

lowed to rest upon it vertically at its center, the plate will acquire by induction the opposite polarity to that of the acting pole at its center and a similar polarity at every point of its circumference.

OTHER PECULIARITIES OF MAGNETISM.

The forces exerted by the two poles of the same magnet are equal as well as opposite. This may be shown by taking two magnets of the same size and quality of steel, tempered and magnetized alike, and placed together so that opposite poles come together. When thus placed it will be found that the action of the two opposite poles at each of the ends will neutralize each other.

The opposite actions of the north and south poles may be shown by the following experiment: A piece of iron, a key for example, is supported by a magnetized bar. A second magnetized bar of the same dimensions is then moved along the first so that their poles are contrary. The key remains suspended so long as the two poles are at some distance, but when they are sufficiently near the key drops, just as if the bar which supported it, had lost its magnetism. This, however, is not the case for the key would again be supported if the first magnet was presented to it after the removal of the second bar. The attraction which a magnet exerts upon iron is reciprocal, which is indeed, a general principle of all attractions.

If the two magnets as above described were placed so that the similar poles of each would come together, or nearly so, the effect would be to increase the polarity of each, that is, there would be once again as much magnetism as before.

It is a good thing to remember that the unlike poles of magnets of the same size will neutralize each other. Compensating, or adjusting magnets, when not in use, should be placed together in this manner so as to neutralize the magnetism of each.

PORTATIVE FORCE.

The portative force of a magnet is the weight which a magnet can support.

ATTRACTION ACROSS BODIES.

Magnetic attraction and repulsion are exerted without modification through any body which may be interposed, provided it be not of some magnetic substance which is too thick for the force to pass through. Magnetism will pass through wood, brass, glass, and even through a stone wall. A magnet still acts as a magnet when incased in wood, brass, etc. Many practical men have an idea that magnetism can be intercepted by placing a piece of wood, a sheet of brass, or of paper, etc., between the iron or steel causing the attraction or repulsion, and the compass needle affected. Such ideas as these are ridiculous. Just try experiments of this kind and see for yourself.

Some authorities claim that magnetic force will not act across a screen of iron, or other magnetic material, or if a small magnet is suspended inside a hollow ball made of soft iron, no outside magnet will affect it. This is not true in all cases, and it all depends on the conditions and circumstances under which the test or experiment is made, or the way in which it occurs.

Experiments made with a small suspended magnet and an ordinary bar magnet, show that the suspended needle when placed inside of an iron kettle, toward the bottom as far as possible, will be affected by the bar magnet on the outside, even when placed below the bottom of the kettle. The suspended needle placed in the oven of a steel range is attracted by the magnet on the outside. Also, through several sheets of steel plate and through the blade of a heavy axe. Of course, this can very easily be accounted for. The magnet in exerting its force in all directions to the limit of its field, could have passed up and into the kettle, and over and around to the opposite side of the steel plate and axe blade. In the case of the kettle the magnet's field was too small to have done this when held beneath the bottom of the kettle, consequently the outside magnetism passed directly through the iron bottom of the kettle. In this it was assisted by the suspended magnet inside the kettle. This is a remarkable property not possessed by light, heat or electricity.

The fact that a magnet, or other magnetic material, is non-affected when placed inside a hollow ball of soft iron, has led many men to believe that the compass needle could be insulated from the ship's iron, by a screen of this kind. There is nothing to it. Those writers do not explain the condition to which the magnet inside the ball is reduced, especially in the case were it a suspended needle. In the first place it would be of no use because it could not be seen. Furthermore, the magnetic needle in this condition ceases to be a magnet, since its interception with all outside forces, is likewise cut off from the earth's magnetism, which gives every magnet its pointing power. If one is shut off both are shut off. If an insulating medium could be introduced it would be entirely valueless in connection with the compass of iron and steel ships.

The idea of placing the compass inside of an iron kettle to screen its influence from the ship's magnetism, originated with the hollow ball. Of course, the ball could not be used, so the next thing to it was employed, and this was the kettle. The compass in the kettle worked more sluggish than when out of it, notwithstanding that the disturbing force from the ship's magnetism is supposed to be diminished. In fact the kettle increases the disturbing force on the needle by reason of its close proximity. The ship's magnetism is increased by the amount of magnetism contained in the kettle, and depends for its amount on the location of the magnetic poles of the kettle. How and where these poles are developed is a matter of conjecture. The iron in a kettle of this kind is not all of the same

quality as regards hardness. There will be soft and hard places, and of course the poles of its magnetism will concentrate at the points where the iron is hardest. This, of course, would all depend on how the kettle acquired its magnetism, whether from the earth's magnetism, or the influence of other magnetic bodies, such as the compass needle, or the ship's magnetism itself. In this case the compass needle would point to those poles no matter in which direction the ship's head is held. The deflection of the needle under these conditions would be enormous. In case the poles of the ship's magnetism were in one with the poles of the kettle, the greater this disturbing force; if not, the force would be considerably diminished. Although the earth's magnetism exerts its influence on the compass needle placed inside the kettle, it is not strong enough to counteract the disturbing force on board.

The fact that the kettle is open at the top permits the ship's magnetism to exert its influence on the compass needle placed within the iron kettle.

It cannot be too strongly impressed on the student's mind that if a given piece of iron produces, say 11 degrees of effect, on a compass needle at a distance of four feet, it will produce precisely the same effect if the space between them should be built up solid with any non-magnetic material he might choose to use.

Now, from this, do not get the idea that a screen of magnetic material, such as iron, steel, zinc, tin, etc., would answer the purpose. While it would have the effect of cutting off the disturbing force back of it to a certain extent, its own influence would be a greater disturbing force by reason of it being that much closer to the needle.

There are many practical men who fancy that by covering an iron stanchion with canvas, and then painting it, or by sheathing it with brass, they can destroy, or rather shut off, its magnetic influence on the compass needle; but unfortunately this is totally impossible. We know of cases where the iron spokes and rim of the steering wheel was covered with a canvas jacket to keep the "attractions" from coming out. We know of other cases where a sheet of brass was placed between the standard and steering compasses to prevent the magnets used in adjusting the standard compass from influencing the steering compass, owing to their close proximity with each other. As has already been stated in these pages, no substance has ever been discovered that will do this.

It may be mentioned here as an important fact that all hollow iron bodies, whether globular or square, such as water tanks, boilers, etc., that as soon as the thickness of the sides has reached 1-10 of the thickness, or diameter of the whole body, the magnetic effect is the same as if the body were a solid piece of iron.

Another important fact that must not be lost sight of is, because a magnet is sealed up in a brass or wooden case, has little or no portative force (lifting power) that its magnetism is weak, and that this weakness is due to the fact that the magnet is encased. The magnetic force is there just the same as if the magnet were not covered. By covering the end of a magnet with brass, and then attempting to lift a small piece of iron or steel it will be found that its portative power is lost. It is the covering that prevents it from adhering to the magnet. A small sewing needle might be found to adhere to the brass at the end of the magnet. By removing the magnet from its case it will be found to have as much portative force as ever, and will be able to support keys, nails, etc.

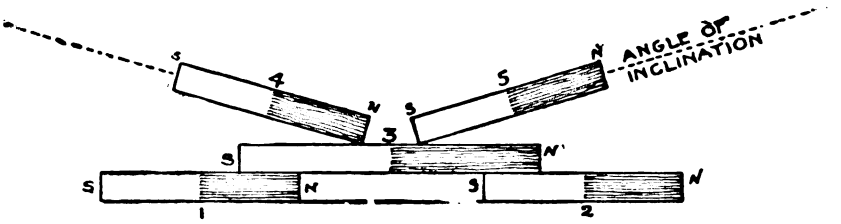



FIG. 21.

Showing magnetization by separate or divided touch. 3 is the magnet that is being magnetized. 4 and 5 are the rubbing magnets. 1 and 2 are powerful magnets supporting the ends of the magnet under magnetization.

To make this more readily understood color the shaded portion (marked N) red and the light portion (marked S) color blue. Imagine the inclined magnets numbered 4 and 5, drawn to the ends of magnet numbered 3. Imagine magnet 5 held in the right hand and magnet 4 in the left hand, and both drawn outward at the same time and at the same inclination. When they reach the ends of magnet 3 they should be lifted back, as in diagram, for the next draw, and so on.

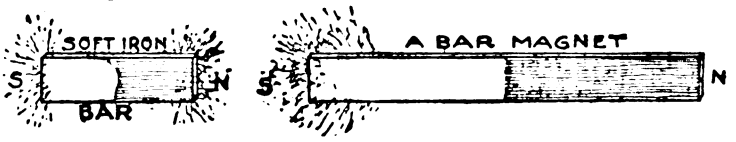



FIG. 22.

Showing magnetic induction; the bar magnet is permanent, the bar of soft iron, a temporary magnet. The soft iron bar is magnetized inductively (at a distance) by the permanent bar magnet. The magnetized state of the soft iron bar is shown by the adhesion of the iron filings, which were sprinkled on to the soft iron bar after the bar magnet was brought into action; the adhesion of the filings to soft iron proves that it is a magnet. If the bar magnet, which is the acting force, were taken away from its present position, the piece of soft iron, which is a magnet by induction so long as the bar magnet is near to it, would lose its magnetism, and the iron filings adhering to the soft bar would all drop off.

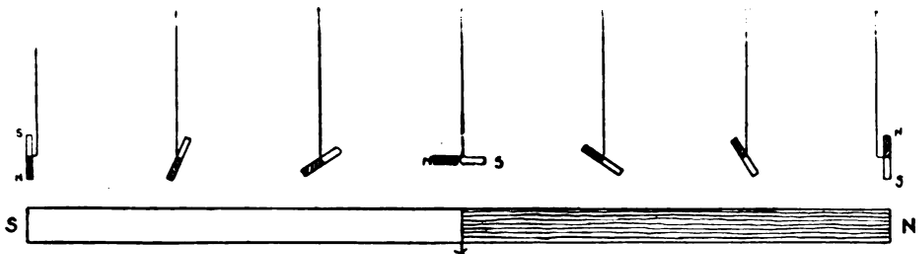
This is another proof that soft iron is unable to retain magnetism after it has been supplied with the fluid. The iron filings will drop off just the same if the piece of soft iron is removed instead of the bar magnet.

To test whether the magnetic force exerted is the same when the magnet is incased or not incased:—Suspend a magnetic needle as in Fig. 16. Have the suspending thread long enough so that the needle will come within a half inch of the table or stand that supports it. Tack a sheet of plain paper on the table under the needle so that the deflections of the needle may be marked on the surface of the paper. After the needle has come to rest, mark its place on the paper by a straight line. Place the magnet incased in a horizontal position on the table with one of its ends or poles, at about right angles to the suspended needle, so that there will be about 15 in. of space between them. The needle will become attracted or repelled, depending on the position of the two poles presented. Let the suspended needle come to rest under the influence of this magnet, and again mark its resting point by a straight line. Note the space between the marks as uninfluenced and influenced. Now, take the magnet out of its case and place it in exactly the same position as before. The suspended needle ought to be deflected the same amount as it was before, and the needle as influenced, should coincide with the second mark. This experiment could be made much easier with an ordinary boat's compass.

### THE EARTH AND ITS TWO MAGNETIC FORCES.

The earth operates as a magnet, and has all the property of the natural or artificial magnet, and at each point of its surface the force emanating from it has a fixed direction and intensity. The direction of the force of terrestrial magnetism is estimated in two co-ordinate planes, the one horizontal, the other vertical. The magnetic needle of the compass (or the needle of the horizontal force instrument) moves in the horizontal plane, that is, it obtains its directive or pointing power from the earth's horizontal magnetic force. It is also called the "Declination" or "Variation Needle," and the true or geographical meridian is taken as the initial line, that is, the direction of the magnetic needle is measured from this meridian.

The magnetic needle, called "Inclination," or "Dipping Needle," moves in the vertical plane, and obtains its directive power from the earth's vertical magnetic force. This is not strictly true, for the dipping needle is also influenced




EARTH'S POLARITY NORTH OF MAGNETIC EQUATOR

EARTH'S POLARITY SOUTH OF MAGNETIC EQUATOR

FIG. 23.

Showing action of a powerful magnet bar (representing the earth's magnetism) on a series of small magnets suspended by threads. N. S. and n. s., north and south poles; X, neutral line, or magnetic equator.

by the earth's horizontal magnetism, that is, the horizontal force acting on a freely suspended needle moving in a vertical plane, would attract it in the direction of the magnetic poles, and the earth's vertical force, called dip or inclination, which varies at different places on the earth's surface, would incline one end downwards at an angle below the horizon, corresponding to the dip, or earth's line of force, at that place. For the present the student need not bother his head about the horizontal force of the earth's magnetism affecting the dipping needle. He may assume that it is only the vertical force that affects it; thus, the two needles are given direction each by a different and distinct cause. For all practical purposes this is true. The only time that these two forces of terrestrial magnetism would have to be resolved in their true phases is in the vibration experiments for determining the vertical magnetic force, that is, not its direction or amount, but its force of intensity. This will be explained more fully further on.

THE TRUE OR GEOGRAPHICAL MERIDIAN.

The true meridian of a place is the plane passing through the place and containing the true axis of the earth, also a true north and south line. The north star (pole star or polaris) at the end of the handle of the little dipper (little bear), located by the pointers of the big dipper, is supposed to mark the true north point of the heavens, and does, but only twice in every twenty-four hours. At such time an imaginary line drawn so as to coincide with it, or to be parallel thereto, will be a true meridian.

THE MAGNETIC MERIDIAN.

The magnetic meridian of a place is the vertical plane passing through the two poles of a movable magnetic needle in equilibrium about a vertical axis; that is, it is the vertical plane in which a magnetized needle tends to place itself, or it is the position which a freely suspended needle moving in a horizontal plane and undisturbed by iron, or by local attraction, would take up if left entirely to itself. A line drawn through, or one drawn to coincide with the needle at rest in this position, would be in the direction of the magnetic meridian.

As we have seen the earth's magnetism is determined both in direction and force of intensity, also that the magnetic poles of the earth's magnetism, to which all magnetic needles point, do not coincide at all places with the true poles of the earth, from whence all directions and positions on its surface are reckoned; and because of such a consequence we have to consider the distribution of its effects over the surface of the globe and the changes it is subject to. These, as we will see, are represented by a system of imaginary lines drawn on the earth's surface.

The first to be considered of these is the direction of the earth's horizontal force as well as the position of the magnetic poles, both of which are responsible for the magnetic (declination) variation of the compass. This is the first of several corrections of the compass to be taken in account by the navigator in shaping his course. The magnetic north and south are not at any one point, that is, the magnetic meridians at different parts of the earth's surface do not cut any one point as the true meridians do. The forms of the magnetic meridians are very remarkable. None of them appear to be exactly a great circle. They converge to a north pole, north of Hudson bay, and a south pole in South Victoria; but these poles are not opposite.

## QUESTIONS FOR WHEELSMEN AND WATCHMEN.—NO. 8.

Question 66 may not have been clear as published. It should read as follows:

Going through South passage, coming island light in view and Green island from the eastward with South Bass shut in to the northward of South Bass island, what would you tell the wheelsman to do if in command of steamer?

The instructor also wishes to state when he doesn't mention what kind of bearing to give, anyone in answering the question can give either bearing, the correct magnetic or true bearing.

Give all shoals and principal landmarks passed on either hand. In taking courses to make good the magnetic course you should take mean variation from point of departure to destination.

82. What is the true bearing of Grubbs Reef gas buoy from Middle Ground lighthouse?

83. What is the true bearing of Grecian shoal from Colchester Reef lighthouse?

84. Give correct magnetic course and distance from Lorain to Southeast Shoal lightship

85. Give correct magnetic course and distance from Huron to Southeast Shoal lightship.

86. Give correct magnetic course and distance from Sandusky to Southeast Shoal lightship.

87. Explain how to navigate a boat from Bar Point lighthouse to red stake at the foot of Fighting island.

88. How is the channel marked from Bar Point lighthouse to lower end of Bois Blanc island?

89. Having stern of boat on Bar Point lighthouse and heading on Bois Blanc lighthouse and Amherstburg ranges obscured from view by smoke or other causes tell us what mark you have to know when to haul on Amherstburg ranges?

90. What mark have you for turning point to bring stern of boat on Bois Island ranges.

91. Which way will current carry you passing up through Ballards Reef channel.

## QUESTIONS FOR OILERS AND WATERTENDERS.—NO. 4.

31. A horizontal tank, 36 in. in diameter and eight feet long, contains 29 in. of water, how many gallons?

32. What is direct and indirect motion applied to valve gearing?

33. What size of rivet would be required for a double riveted lap joint steel plates in the shell 7/8 in. thick and what distance should they be from the edge of plate.

34. What is a true vacuum and how is a vacuum formed O. B. ship?

35. Should you notice the vacuum hand at 10 or 15 in., what would you do?

36. Should the bearings of a direct-connected dynamo wear down, what effect would this have on the dynamo in general?

37. Lying in port and there should be a necessity for applying a hydrostratic test to one of the battery, what precautions would you take?

38. What damage would be liable to occur?

39. How could you ascertain the number of kilowatts the dynamo is rated at if there was no name plate on the machine?

40. Should you have a continued pounding noise in the purifier, what would you consider was out of place?

## QUESTIONS FOR MASTERS AND MATES.—NO. 7.

101. What is meant by the earth's horizontal magnetic force?

102. What is meant by the earth's vertical magnetic force?

103. In which magnetic plane does the compass needle move, horizontal or vertical?

104. In which plane does the dipping needle work, vertical or horizontal.

105. What is meant by the earth's total magnetic force?

106. State the position the dipping needle must be placed in in order to receive the earth's total magnetic force.

107. Where is the earth's magnetic horizontal force greatest and where least?

108. Where is the earth's vertical force greatest and where least?

109. Where is the variation greatest and where least?

110. How would you steer by compass (no deviation) from the magnetic pole to the true north pole?

111. Take the steel masts of any of our lake boats; where are their magnetic poles located, or which end of the mast is a north pole and which end a south pole? How do these masts become magnetic?

112. Which portions of these masts will be found to have no magnetism?

113. Which end of a dipping needle should point toward the earth on the lakes?

114. About how many degrees of dip do we have on the lakes?

115. Why is the north end of a magnetic needle called a north pole?

## SUBMARINE SIGNALS.

The tests of submarine signals instituted by the United States lighthouse board have resulted successfully, and as a consequence the board has ordered equipments for ten lightships, with the understanding that five others are to have the apparatus installed upon them immediately, so that they can be taken over by the government in due time. Orders have been issued to the coast survey to mark upon the charts all light vessels equipped with submarine signals; and notice has been sent to mariners that during storm and fog the signals will be rung, during the same time that the fog whistle is blown. In short, the United States government has formally adopted submarine signaling and has taken the necessary steps to put the system in operation from Portland to Cape Hatteras.

Hereafter, all vessels equipped with the receiving apparatus will be able to get position accurately in respect to the most important points on the Atlantic coast; and vessels not so equipped will be able to ascertain their proximity to these points more certainly than by the fog whistle, by reason of hearing the bell sounds through the sides of the ships. In the latter case, however, the matter of position will have to be guessed at, as is now the case with air signals.

The work of equipping Canadian waters has been in progress during the summer, and the lightships in the St. Lawrence river have been equipped with the approved type of bells. A shore station has been installed at Chebucto Head, at the entrance to Halifax harbor, where submarine bells are rung electrically two miles from shore, by means of cable connections. Four other stations are being installed in like manner. In addition, thirty Willson bell buoys, adopted by the Canadian government for use on exposed points, are constructed with receptacles for submarine bells, and these bells are being supplied as fast as they can be turned out.

At Liverpool the Northwest lightship has been equipped with a submarine bell, which is used by the Cunard and White Star steamers. The latter company has ordered equipment for nine additional steamers making New York and Boston. The British admiralty has ordered equipment for one of the warships of the channel fleet, with a view to the general adoption of the system for the British navy.

At Cherbourg, the North German Lloyd Co. has equipped its tender Willkommen with a submarine bell, and on July 23, in a dense fog, the Kaiser Wilhelm II received the signals at a distance of fifteen nautical miles, and obtained direction accurately, so that she came up to the tender without delay.

The French government is installing bells on the Sandettie lightship; and Germany has a number of bells in regular operation on her coasts. The Danish government has begun negotiations for the equipment of their light vessels; and the Australian vessel men have reported that that government was ready to adopt the system when suitable arrangements can be made.

As soon as the installation on the Atlantic coast of the United States is completed, the equipment of the Pacific coast, where fog is the greatest menace to navigation, will begin; and then provision for the great lakes will be made.

The lighthouse board tests were unusually searching, since they required the bells on five light vessels to be rung continuously night and day for sixty-two days. Nantucket Shoal light vessel bell was in operation 1,453½ hours, and was stopped 7½ hours. Sandy Hook light vessel bell was in operation 1,444 hours and 50 minutes; was stopped 19 hours and 10 minutes, 6½ hours to change ships and five hours and 50 minutes to change bells. Fire Island light vessel bell was operated 1,450 hours and 28 minutes; was stopped 13 hours and 32 minutes. Boston light vessel bell was in operation 1,418 hours and 10 minutes; was stopped 45 hours and 50 minutes. During 38 hours and 40 minutes a spare bell was at hand, but was not used. Pollock Rip Shoals light vessel bell was in operation 1,427 hours and 40 minutes; was stopped 36 hours and 20 minutes, of which time 12 hours and 55 minutes was consumed in repairing ship's boilers or in overcoming the results in a collision.

The test of 62 days' continuous ringing was equal to two and one-half years' service, according to the highest number of hours that the fog whistle has been in operation on Sandy Hook light vessel; namely, 600 hours in one year. Moreover, there was no opportunity, such as is ordinarily afforded, to overhaul the mechanism of the bells between periods of ringing, thus keeping the bells in good condition. A bell was lowered over the side of a light vessel, and was made to ring continuously until something gave out.

When one considers the nature of the machinery necessary to produce a regular sound at intervals never exceeding six seconds, under 25 ft. of water, the actual performance of the submarine bells during June and July abundantly proved the ability of the apparatus to stand up under a test much more severe than it can possibly receive in actual practice. The records for July show a decided increase in efficiency, thus proving that as the experience of the light vessel engineers increases the results are bettered. It is to be noted, also, that the operation of the bells has been so uniform as to volume of tone that no vessel has reported failure to get direction.

The government asked masters of vessels to report in detail their experience with submarine signals as an aid to navigation, and furnished printed forms for such reports. These reports have been compiled and printed. Some of the results are particularly interesting. Thus the Cunard steamship Lucania heard the Nantucket Shoals bell 7½ miles and the whistle 2½ miles; she steered entirely by the bell. The Saxonia, of the same

line, reports hearing the bell on the Northwest lightship at Liverpool five miles, while going at full speed. The Caronia reports hearing the Nantucket bell 4¾ miles. The captain testifies that he made all three lightships (Nantucket, Fire island and Sandy Hook) by the bell; and might have missed them except for the submarine signals. The White Star steamship Oceanic reports the greatest distance. On July 11, in a thick mist, she heard the Nantucket bell "very distinct and clear" at 10.45 miles. The same day, in clear weather, she heard the Fire Island bell 7½ miles and the Sandy Hook bell five miles. On glancing over the reports it is noticeable that in thick weather the bell is heard at a greater distance than in clear weather. In other words, captains, being anxious in time of fog, began to listen earlier and gave closer attention.

The Kaiser Wilhelm II makes official report of having passed Nantucket shoals at a distance of 6½ miles and having located position by means of the submarine bell, without seeing that lightship or hearing her air signals. So, too, on July 7, the Kaiser Wilhelm Der Grosse reports passing the same lightship in a fog, getting her location by the bell, without hearing the whistle. On July 10, the same steamer reports hearing the Fire Island bell at 5½ miles while going at full speed. The captain of the steamship Bremen, of the same line, on July 17, reports: "We are sure we should have missed the light vessel (Nantucket shoals) altogether without the submarine bell." The bell was heard 35 minutes before the whistle, the speed being eight knots.

The Hamburg-American steamship Deutschland on June 21 reported that approaching Nantucket shoals she could not see the lightship and had no communication by wireless, but got the submarine bell at a distance of four miles. On June 30 the Amerika reported seeing the steam of the Fire Island light vessel when 1½ miles distant, but hearing no sound from it. The submarine bell was heard clearly and distinctly four miles away.

The French Line steamers report that in hazy weather the Lorraine got three miles, and in fog La Provence got five miles, thus showing that the character of the reports on the signals depends largely on the attention given by navigating officers. Indeed, the captain of the Savoie, who got a distance of about 1¾ miles on a clear day reports five miles on other occasions.

The experience of coastwise steamships during the test has been quite as convincing as that of the ocean liners. Ever since experimental work began on submarine signaling as a commercial proposition, the receiving apparatus has been installed on the Metropolitan steamships running between New York and Boston; so that the captains of those vessels are familiar with it. The captain of the H. F. Dimock considers the bell far superior to the whistle and should depend on it entirely if he could be positive it would be rung in thick weather. The captain of the H. M. Whitney says he "often hears the bell when there is too much noise by wind and sea to hear the whistle;" and, again, that he "heard the bell a greater distance than he generally does the whistle."

The captain of the Standard Oil Co.'s steamer Standard, who was not ready to give an opinion at the beginning of the tests, later reported twice that he considered the system a good aid to navigation. The Merchants & Miners Transportation Co.'s steamer Nantucket and the Boston & Philadelphia steamer Indian, and the Red Cross Line steamer Rosalin also make favorable reports.

There are three reports from sailing vessels—the Boston pilot boat Varuna, reporting four miles; the fishing schooner M. E. Harty, four to five miles, and schooner Gifford, three miles. The Gifford had no receiving apparatus, but got the sound of the bell through the sides of the ship. This is but one of a multitude of instances of like character. For example, it is of record unofficially that the fishing schooner Arthur Binney on June 20 carried the sound of the Nantucket Shoals bell seven miles, getting the sound through the sides of the vessel. These numerous experiences warrant the statement that even in the case of vessels not equipped with the receiving apparatus, it is possible to obtain warning of proximity to danger points with more certainty by means of submarine signals than by means of air signals.

## SHAMEFUL NEGLECT OF ONE OF THE GREATEST OF AMERICAN INDUSTRIES.

BY ANDREW V. HENRY IN LESLIE'S WEEKLY.

The foreign trade of the United States, according to the expert testimony of W. E. Humphrey in the *North American Review*, last year amounted to more than $2,240,000,000, the balance of trade in our favor exceeding $400,000,000. Of this immense total only about seven per cent was carried under the American flag. Shame!

Every day more than $500,000 is withdrawn from the treasury and paid to foreigners for carrying American trade. Ninety per cent of this vast sum is expended in wages to foreign labor. Shame!

During the year 1903 not one vessel flying the American flag and engaged in the foreign carrying trade was seen in the port of Philadelphia, the second seaport city of this country. Shame!

Seattle and Tacoma are the only ports in the United States from which more tonnage is carried in American than in foreign bottoms. Shame!

Germany has built, in the last two years, ships of more tonnage than the entire merchant marine of the United States. Shame!

We have warships which we are unable to furnish with crews. If we had lost a single first-class fighting ship in the Spanish war, with all hands, we could not have furnished officers and men for another. Shame!

It costs from 40 to 100 per cent more to build an American than a foreign ship, and from 20 to 40 per cent more to operate it. All other countries pay subsidies. We do not. Shame!

Of three trans-Pacific steamship lines the Japanese receive an annual subsidy of $333,500, the English $300,000, and the American $4,935. Shame!

The only nations that have tried to create a great navy without men to command it and auxiliary ships to support it are Russia and the United States. Trained seamen from Japan's subsidized merchant marine manned the warships that destroyed the Russian navy. We have no merchant marine worth talking about. Shame!

We call the United States a "world power," and if we were at war with a foreign country we could not transport enough troops to protect the Philippines from seizure. Shame!

Foreigners having a monopoly of our carrying trade, we are not only unable to prevent a combination among them (such as now exists among the Pacific coast sailing vessels) to maintain high freight rates on the products of our farms, but we are unable to overcome the foreign shipping lobby which stands in the way of a subsidy bill at Washington. Shame!

War between two such countries as Great Britain and Germany would result, by the withdrawal of their ships from the carrying trade, in the paralysis of our foreign commerce and the consequent demoralization of our domestic industries. Shame!

The republican party protects every American industry but the shipping interest from the competition of foreign cheap labor. Shame!

The maximum subventions provided for in the proposed subsidy bill to ten mail lines are: Atlantic lines, $1,050,000; Gulf, $475,000; Pacific, $1,140,000—a total of $2,665,000. The new vessels of the lines receiving these subventions must be built under the direction of the navy department, and all vessels receiving such aid must carry an increasing proportion of naval volunteers. A tonnage subvention of $5 per gross ton to

any vessel engaged for a year or more in foreign trade is also provided, but no vessel receiving mail subventions may participate in these benefits. Even this moderate subsidy has been held up in congress. Shame!

"If the foreigner can do our carrying more cheaply, why not let him do it?" This is the gist of argument against protection, as well as against a subsidy. History shows that the American shipping industry, if protected, would not only be able to displace the foreign shipping in our ports, but also to reduce freight rates on our farm and factory products, and increase the wages of labor. The republican party is pledged to a ship subsidy bill, but a republican congress would not pass it. Shame!

The net cost of carrying out the subsidy commission's plans would not exceed $40.000,000 in ten years, even if every contemplated steamship line should be established and 1,500,000 tons of new shipping added to the American-owned foreign fleet. President Roosevelt has declared himself heartily in favor of the proposed policy of the upbuilding of the American merchant marine, and professes his belief that the measure will become a law. Yet it hangs fire at Washington. Shame!

In eight years a subsidized German line to the East Indies increased its export trade from 27,369 to 89,148 tons; an East African line, under subvention, did a business of 453,000 marks in 1892, and of 1,476,000 in 1898. In that year both subventions were renewed for fifteen years. Japan's tonnage has increased from 200,000 tons in 1896 to 830,000 tons in 1904. Her commerce was $153,251,000 in 1896; it was $342,160,000 in 1904. A line of subsidized ships runs from San Francisco to British Australasia. The exports on this line have increased from $12,674,000 in 1896 to $27,401,000 in 1904. Since 1895 our export trade with Brazil has decreased from $15,000,000 to $10,000,000 in 1903. Shame!

James J. Hill's two magnificent steamers, running from Seattle to the Orient, have aided the vast expansion of Oriental markets for American products, especially for wheat. Mr. Hill says he will never build another ship in America as long as present conditions last. The Boston Steamship Co., which has five great steamships plying between Seattle and the far east, announces that it will discontinue the service unless assistance comes. Shame!

According to Senator Frye last year not one American vessel entered or cleared in the foreign trade in Austria-Hungary, Denmark, Italy, the Netherlands, Russia, Spain, Norway, Sweden, Portugal, Greece, Scotland or Ireland. Shame!

If British and German vessels now carrying our $1,480,000,000 of annual exports should be withdrawn from commerce by reason of war between England and Germany, the farmers, manufacturers and wage earners of the United States would pay, in hindrance to our commerce, a penalty nearly, if not quite, equal to that paid by either of the contending parties. Shame!

We are spending hundreds of millions of dollars for a Panama canal for the accommodation almost entirely of foreign ships. We have spent about $5,000,000 on the harbor of Galveston, and only one American merchant ship uses it. Shame!

If the subsidy bill were passed, 1,500,000 tons would be added to our shipping. It would give investment to $700,000,000 of American capital and employment to 500,000 American workmen. American labor would receive $1,000,000 a day that is now paid to foreigners. Our markets would be widened; our exports increased; freights reduced; export prices increased and import prices decreased, and our ship yards would be built up. The United States would be made independent of other nations, and, with its flag known and respected abroad, would be worthy of the appellation of a world power. But a republican congress could not, or would not, realize the gravity of the situation. Shame!

## LAKE SHIP YARD METHODS OF STEEL SHIP CONSTRUCTION.

BY ROBERT CURR.

Fig. 43 shows plan of complete girder.

The girder plate being square makes the laying out of same simple. The frame spaces are lined off on the plate after the width of the plate has been measured. This plate is ordered the exact size so that no shearing is required, and if the edges are round or hollow, a line the width of mold rivet holes is put on the plate and the edge of mold applied to same. This plate is marked by means of strips, the holes for A, the intercostal and B the bottom girder angle are the same and are spaced six inches apart. A strip is made the width of the angle two frame spaces long, and by this means the plate, whatever length, is marked at the bottom for the continuous girder angle.

The girder stiffener mold D is applied to the line put on for the frame space which is square to the top and bottom of plate, the top and bottom being the tank top line and the top of floors, as shown on plan Fig. 43-A.

This girder stiffener has a rivet spacing of six inches and care is taken to have the holes regularly spaced. The bottom hole for the girder angle and intercostal is a gauge for this frame space for the hole in the girder stiffener mold must agree with same. At the turn of the frame a change of the rivet spacing takes place on the top and bottom angles, owing to the floor being turned so that the flange will look forward in the fore body and aft in the after body.

This turning of the floor channel causes the girder stiffener heels to look away from each other in the frame space where this change takes place. This change affects everything from the center keelson to the spar deck, and it is not an unusual thing to see a mix up here at times.

The top angle of the girder is composed of clips, as shows at H. The girder plate is scored out so that the tank top underside angles are made continuous, as shown by K and M from center keelson.

These angles are spaced eighteen inches apart for tank top stiffening. The angles marked K are intermediate and run up the tank side about two feet. At the girders and center keelson flanged bracket plates connect these angles to same, as shown at Fig. 43 and Fig. 43 B. Fig 33 shows mold for same.

The tank top stiffeners marked M run from the center keelson to the bilge and are connected to the girder stiffeners with bracket plates shown by D 2, Fig. 43 A. Fig. 16 shows the mold for this angle and Fig. 11 shows mold for the bracket plates.

The top angles for the girder plates H are marked from molds tee shape, Fig. 44.

A mold with three holes is used for marking the plate with, as shown at H, remembering the change at the turn of the frame which will be lengthened.

The intercostals A Fig. 43 and Fig. 43 A are flanged to the shell, as shown by plans.

The top of the intercostal is fitted between the girder plate and bottom girder angle being joggled at this part so that it will fit close to the girder stiffeners and save linering, as shown at A Fig. 43 A. A mold is made similarly to Fig. 46 and flanged, as shown by Fig. 47.

The clips marked C for the intercostals are marked from molds made like Fig. 24 and Fig. 44, also the floor part of the girder mold, Fig. 10. In way of the plate floors the difference of the thickness of the plate will have to be considered in relation to

the shell holes through the frame angle.

It will be noticed that the channel floor is spaced three feet apart and the girder stiffeners are riveted to same which makes a three feet spacing of both floor and stiffener. The shell holes will have to be considered when an angle frame occurs or the girder angle moved back the thickness of deep floor. Where the frames differ in construction a standard is made of one frame.

The lap butts on the girder are so arranged to come in way of two rivet holes on the top and bottom angles so that no change is necessary at these parts in the rivet holes. Where a girder is curved on the bottom a mold is made for same.

Fig. 45 shows the continuous channel side stringers and intercostals.

The channel is marked with strips for frame holes, straps and holes for intercostals, as shown by molds Fig. 13-42.

Fig. 24 shows mold used for marking clips for intercostals.

Fig. 41 shows mold for intercostals when same are flanged before being marked and all bracket plates which are flanged first are marked by this means as seen by Fig. 25 also.

Fig. 46 shows a mold made for the side stringer intercostals. The intercostals are punched from this mold and when sheared to shape are placed in a slot in the rolls, Fig. 47, and flanged cold very quickly. Fig. 47 shows a very cheap and quick method of flanging small plates.

In this case a slot is made in the plate rolls four inches deep, as shown at A Fig. 47, the plate is put in as shown at B and the rolls moved until the plate passes under the upper roll flanging same to shape C, the desired shape of the intercostal. Should the flange be required less than four inches, as in this case, a packing piece is put in to make up the difference in depth of flange in the bottom of slot in the rolls. When plates are flanged after being punched, care must be taken to flange same to marks given or the brackets will be made useless. In this case three inches is the gauge given for the rolls for flanging same and when the plate is flanged it measures three and one-half inches over the thickness of the material.

It would be impossible to get fair holes in punching before flanging without making some kind of a test.

In this case a piece of plate one inch wide and twenty inches long is bent in the rolls, as shown by Fig. 47, and then the depth of the flange is marked upon same which determines the amount which must be put in the slot in the rolls to obtain the three and one-half-inch flange.

To obtain the exact material in any plate flanging method, the radius of the turn of the flange must be determined first. Fig. 49 shows the difference between a square heel and a radius of one inch and seven-eighths (1⅞").

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H. A. McKinnon, of the McKinnon Iron Works, which was completely gutted by fire at Ashtabula, Sunday, announced Tuesday that his firm will erect a temporary building for a machine shop and have things running in ten days. A complete new plant will also be started simultaneously. The McKinnon office will be located in P. H. Cheney Sons' store until the new plant is completed. The McKinnons lost $35,000 over their insurance.

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Henry J. Devney, who was burned out last Sunday morning at Ashtabula, announced Tuesday that he will put up a temporary building to continue his ship repairing. During the winter he will erect a permanent building. He lost over $6,000 by the fire, including two valuable pictures of Ashtabula as it used to look.

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The steamer C. A. Eddy caught fire on Lake Huron this week and had to be abandoned by the crew. Distress signals were sounded and Capt. Simpson, of the City of Mackinaw responded. A heavy sea was running and Capt. Simpson decided that the safest way to get the crew off was to lay alongside. He accordingly steered the City of Mackinaw to windward of the burning freighter and with great excitement among the passengers, took her crew aboard. The Eddy was later picked up by the lumber steamer F. A. Mayer and towed to Port Huron. The steamer is owned by the Gilchrist Transportation Co. of Cleveland.

## ITEMS OF GENERAL INTEREST.

The death is announced of Mr. Robert Cook, chief engineer of the Anchor line steamer Columbia. Mr. Cook was in the service of the company for 44 years, having risen from junior to chief engineer, passing from ship to ship as these were launched by the company. He had reached the age of 69 years, and only two months ago, owing to failing health he tendered his resignation.

The British house of commons has now passed the Mersey docks and harbor board's bill, under which it is intended to carry out certain dock extensions at an estimated cost of $22,500,000. The works include the making of two dock entrances, each 130 ft. wide, and 40 ft. deep. These will be the largest in the world, and are intended to facilitate the docking of great liners. Several new docks are also to be built which will accommodate the largest liners afloat or building.

The directors of Babcock & Wilcox, Ltd., Renfrew, water-tube boiler makers, and Stirlings, Ltd., have formulated a scheme for a fusion of the companies, which have been in keen competition. This amalgamation of the two famous Scottish boiler-making concerns, should auger well for the future prosperity of both companies. Messrs. Babcock & Wilcox have earned a world-wide reputation with their patent boilers, and they are to be found in all parts of the world. They were reported upon by the British boiler commission, and have not looked back since. They are undoubtedly an excellent steam producer. As to the Stirling boiler, that also has earned laurels in the contest, and the makers have produced a reliable water-tube boiler, and demonstrated by severe tests that it is suitable for naval and other purposes.

The preliminary preparations for the reconstruction of the new deep-water dock on the Humber at Immingham, near Grimsby, have advanced to such a stage that the promoters, the Humber Commercial Railway & Dock Co., have arranged for the first sod to be cut on July 22. The dock will be the finest on the east coast of Britain, and will accommodate the biggest battleships. Three thousand men will be engaged six years in the construction.

The annual picnic of the Lunkenheimer Co., of Cincinnati, occurred on July 28. The picnic was held at Woodsdale island, a pleasure resort about thirty miles from Cincinnati on the Cincinnati, Hamilton & Dayton railroad and was tendered to all the employes of the company, together with their families. At these picnics the company furnishes all the amusements, refreshments and transportation free of charge to the employes. Two bands of music were in attendance, together with a troupe of professional entertainers, and it is reasonable to assume that the employes had a good time. Two trains of ten cars each were employed to convey the 2,500 persons to the picnic grounds.

The steamer President, building by the New York Ship Building Co., Camden, N. J., for the Pacific Coast Steamship Co., will be delivered in February. The President is a single-screw steamer of the following dimensions. Length over all, 416 ft. nine inches; length between perpendiculars, 399 ft. 11 in.; breadth 48 ft.; depth, 29 ft. 2½ in. Her engine will be triple-expansion with cylinders 34, 56 and 90-in. stroke, supplied with steam from eight Scotch boilers, 15 ft. diameter and 12 ft. long.

Lewis Luckenbach, head of the towing and wrecking company which bears his name, died at his summer home in the Thousand islands recently. Mr. Luckenbach was born in Germany 71 years ago and was one of the pioneers in the towing business of New York.

The new steamer Hendrick Hudson, of the Hudson River Day Line, underwent a trial on the Hudson river recently and is said to have attained a speed of 23⅞ miles.

H. G. Crawford, of Portland, Ore., is having built at the yards of Joseph Supple, a stern-wheel steamboat, 30 gross tons; 60 x 11 x 3 ft.; one 45-H. P. gasoline engine.

The Willamette Iron & Steel Works, Portland, Ore., is about to close a contract for a cross-compound, stern-wheel steamer to be used for towing log rafts and also general towing on the lower Columbia.

Mr. P. A. Jerguson has purchased the plant, contracts, good will, etc., of the William T. Bonner Co., and will continue the business as successor to C. A. Clarke, as trustee for the William T. Bonner Co., under the name of Jerguson Mfg. Co. Mr. Jerguson was originally superintendent for the Wm. T. Bonner Co., before their assignment, and for the past few months has been superintendent, under the trustee's management. Mr. Jerguson has had an extended experience in practical marine, stationary and locomotive engineering, and particularly in connection with the mechanical appliances on warships, and he is therefore admirably fitted for making the special equipment which he proposes to manufacture. While conducting the business of the Wm. T. Bonner Co., Mr. Clarke, as trustee, found the product to be satisfactory to customers in every particular, and he bespeaks for Mr. Jerguson and the Jerguson Mfg. Co. a continuation of the business with which the Wm. T. Bonner Co. has been favored.

C. H. Mallory & Co. of New York, have given a contract to the Newport News Dry Dock & Shipbuilding Co., Newport News, Va., for the construction of a freight steamer for the Galveston-New York service. Her general dimensions will be 417 ft. long, 54 ft. beam and 37 ft. deep. She will have accommodations for 200 passengers.

## TRADE NOTE.

The De La Vergne Machine Co., foot E. 138th street, New York, reports the following among other recent orders received for "Hornsby-Akroyd" oil engines; Central New England Ry. Co., Hartford, Conn., seven H. P. geared to pump; F. J. Stokes Machine Co., Philadelphia, Pa., 25 H. P.; the Hastings Pavement Co., New York city, 16 H. P.; the W. F. Norman Sheet Metal Mfg. Co., Nevada, Mo., 50 H. P.; Union Ballast Co., New York city, one 20 H. P. and one 32 H. P.; D. P. Forst & Co., Trenton, N. J., 13 H. P.; Webb Wire Works, New Brunswick, N. J., 32 H. P.; Messrs. J. W. Lippincott, S. P. Scott & Max Meyer, Little Rock, Ark., 50-H. P. engine to drive a De La Vergne ice machine.

## SUIT FOR BIG SALVAGE.

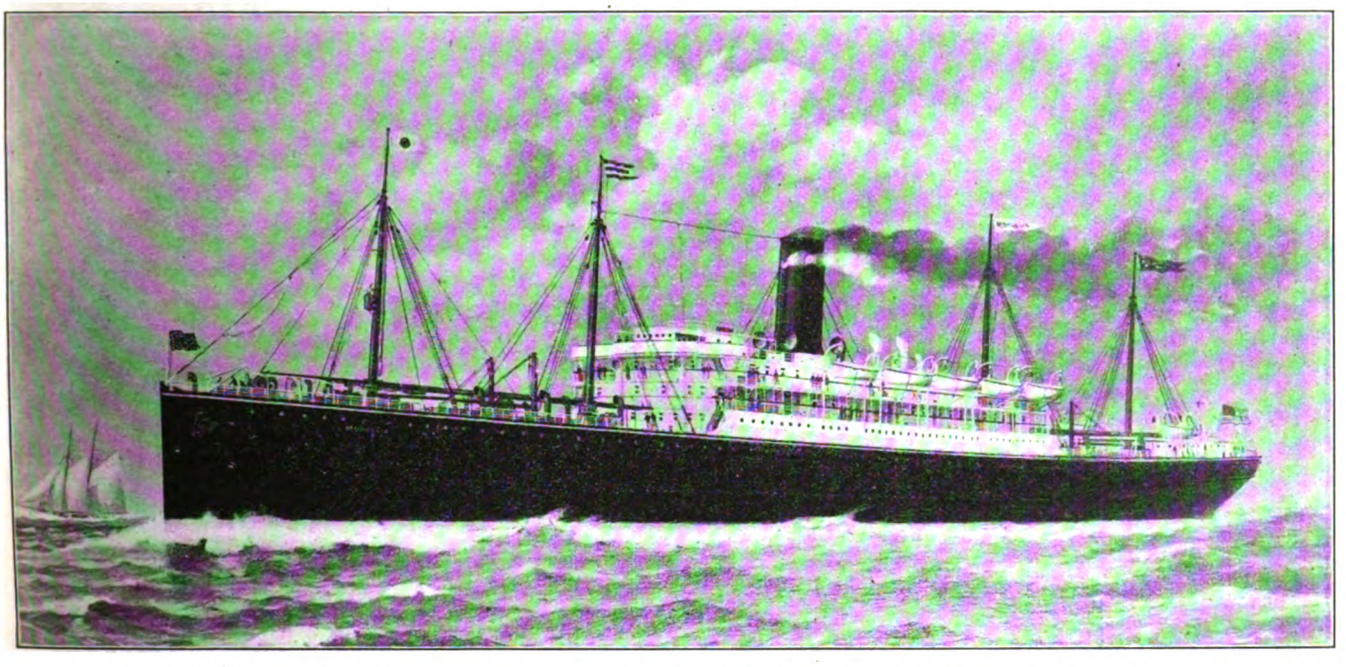
Salvage suit has been brought in the United States district court in San Francisco to recover $100,000 by Sudden & Christensen, against the steamship City of Puebla. The suit is to settle the question as to the sum which should be allowed the plaintiffs. This firm is the owner of the steam schooners Chehalis and Norwood, and these vessels rendered services in towing the City of Puebla to the entrance of San Francisco harbor in January, 1905. It is claimed by the plaintiffs that the value of the vessel and cargo was such that $100,000 is a reasonable fee for salvage. It is shown that the City of Puebla was in distress near Tillamook rocks, off the Oregon coast, and that in response to her signals the steam schooners Norwood and Chehalis came to the relief and towed the vessel to the entrance of San Francisco harbor. The case will be tried before Judge De Haven without a jury. Owing to certain complications involved, this suit is attracting great interest in shipping circles.

THE MARINE REVIEW

VOL. XXXIV. CLEVELAND, AUGUST 30, 1906. NO. 9.

# New York Shipbuilding Company

**Main Office and Works, Camden, N. J.** **New York Office, 12 Broadway**



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Pneumatic and Electric Tools; ample wharfage accommodation.

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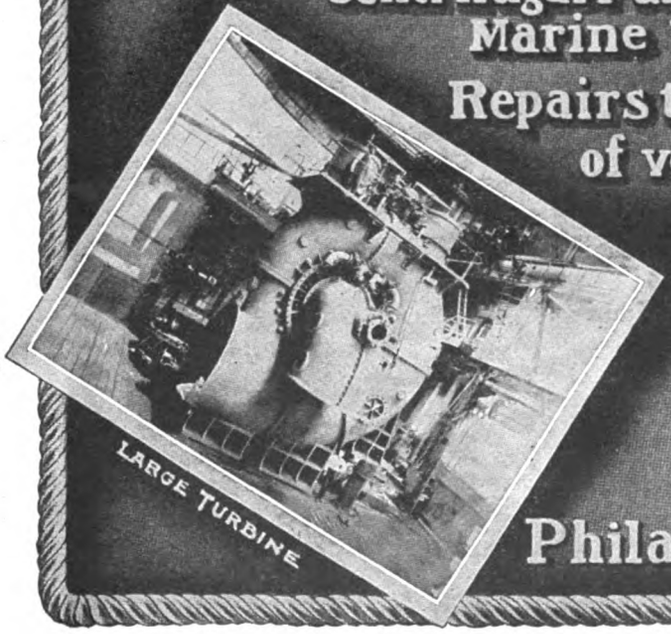


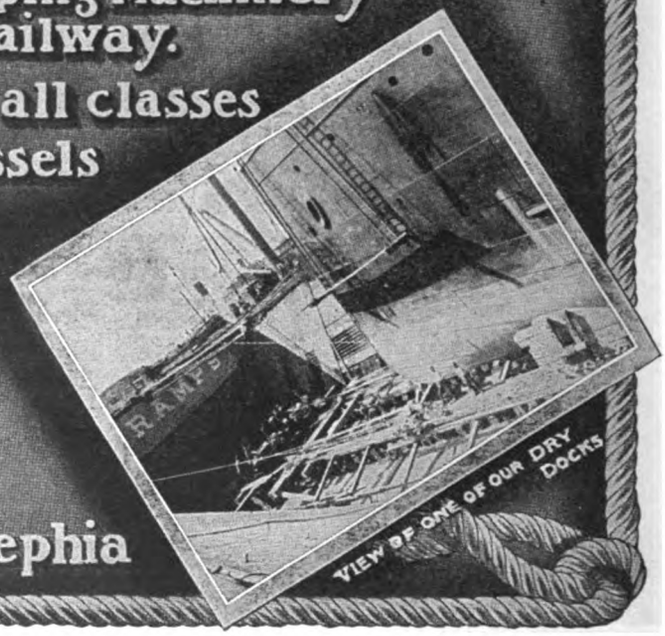


Philadephia

# WANTED and FOR SALE

## PROPOSALS.

U. S. Engineer Office, Jones Building, Detroit, Mich., Aug. 22, 1906. Sealed proposals for removing earth and boulders from Section 3, channel along Bois Blanc Range, Detroit river, will be received at this office until 2 p. m., Sept. 11, 1906, and then publicly opened. Information furnished on application. Chas. E. L. B. Davis, Col., Engrs.

## FOR SALE.

### Steamer T. S. Christie.

Length 160 ft.; beam 30 ft.; carrying capacity, lumber 525,000 ft., coal 800 tons. Rating in Inland Lloyds Register, A1½*, valuation $22,000. For price and particulars address Capt. P. Larsen, Box 249, Chicago, Ill.

### For Sale, Tug Gladiator.

Length, 115 ft.; breadth, 22 ft.; depth, 12 ft. Steeple compound engine 22 x 42 x 30. Housed in forward. Tug can be seen under working conditions at Duluth, Minn., by applying to Split Rock Lumber Co., Duluth, Minn.

### Tug Boat.

Tug Boat for sale—62 gross tons, A1 condition; also light draught steamer, 380 tons, 165 ft. A. P. LANE, 520 Commercial, Boston, Mass.

### Steamer Canada.

123 ft long, 24½ ft. beam, hull, 4-inch oak; speed, 11 to 12 miles; 200 tons freight, 8 state-rooms for passengers, dining accommodation and equipment for forty passengers, ferry license for 450 people; engine fore and aft compound 18 and 32 by 18, new Scotch boiler 11¼ x 13, electric lighted. Can now be seen running on ferry route between Owen Sound and King's Royal Park. Possession given after September 1st, price $7,000.00. For further particulars apply to J. K. McLaughlan, Owen Sound Park Co.,

## FOR SALE.

### Steamer for Sale Cheap.

The lighthouse steamer Haze, 145 ft. long, 27-ft. beam, 9-ft. draught, 500 tons capacity, 300 horsepower engine and boiler, suitable for passenger or freight business, fully equipped. Steam capstan, donkey boiler. Jacob Ullman, 46 Lloyd street, Buffalo, N. Y.

### Steamer Hazel.

FOR SALE.—The passenger and freight steamer "Hazel." Length, 93 ft.; beam, 18 ft.; draught about 7 ft. 6 in. For further particulars address R. B. Rice, Grand Haven, Mich.

### For Sale.

1,000 h. p. fore and aft Neafie & Levy compound Engine; surface condenser; independent pumps.
Two 12-foot Scotch Boilers.
One 13½-foot Scotch Boiler.
One 10 16-25 x 16 triple expansion Engine.
Three 150-h. p. Almy Boilers.
One 200-h. p. Tregurtha Boiler.
One 14 30 x 24 fore and aft Engine and condenser.
One Williamson steering Engine.
One 10 k. w. electric lighting Set.
One 15 k. w. electric lighting Set.
One Providence Windlass, 50 fathoms 1½ in. chain.
Two thrust Shafts and Bearings, 8½ in. diameter.

MARVIN BRIGGS,
17 Battery place, New York, N. Y.

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**Five Scotch Boilers, allowed 160 lbs, steam. Good as new. ERIE MACHINERY CO., 729 Garfield Bldg. Cleveland, O.**

### FOR SALE

Revolving or "Whirley" Derrick. In good order. Immediate possession.

Address:

916 Sixteenth St. Detroit, Mich.

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MAN WANTED near Cleveland, to show and assist us to sell properties. No experience necessary, if you are willing to let us teach you the real estate business. Salary $60.00 a month to start. Steady position to good man, who is willing to devote part of his time to handling customers. Address W. C. Cunningham, Andrus Bldg., Minneapolis, Minn.

INFORMATION WANTED regarding good farm for sale, with good title, somewhere near Cleveland. Give price, description and character of soil. Also state when possession can be had. Owners only, need answer. State how far from town. Address W. C. Cunningham, Andrus Bldg., Minneapolis, Minn.

### PASSENGER STEAMER.

WANTED.—A small passenger steamer in exchange for tug 77 ft. over all, beam, 18 ft.; draught, 7 ft.; engine, 16 in. by 16 in.; boiler, steam allowed, 110; hull rebuilt 1904. Address C. H. M., MARINE REVIEW, Cleveland, O.

### Tug.

WANTED to purchase large powerful tug capable of towing heavy barges on nine hundred miles outside run. R. L. Gillchrest & Co., Mission Wharf, San Francisco.

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For a more complete classification than that represented by advertisers in The Marine Review, see the BLUE BOOK OF AMERICAN SHIPPING, Marine and Naval Directory of the United States, published by The Marine Review, Cleveland.

[See accompanying Index of Advertisers for full addresses of concerns in this Directory.]

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.....Newport News, Va.
Shipowners' Dry Dock Co.Chicago.
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..... ..... Superior, Wis.
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..... Hoboken, N. J.
Toledo Ship Building Co.....Toledo.

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..... Manitowoc, Wis.

### DYNAMOS.
General Electric Co.....
..... .....Schenectady, N. Y.
Thropp & Sons, John E.....
..... .....Trenton, N. J.

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.....Schenectady, N. Y.

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Thropp & Sons, John E.....
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American Ship Building Co.....
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Atlantic Works, East Boston, Mass.
Chicago Ship Building Co., Chicago.
Chase Machine Co.....Cleveland.
Cramp, Wm. & Sons, Philadelphia.
Detroit Ship Building Co., Detroit.
Fletcher, W. & A. Co., Hoboken, N. J.
Fore River Shipbuilding Co.....
..... Quincy, Mass.

### ENGINE BUILDERS—Continued.
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Hall Bros. ..... Philadelphia.
Lockwood Mfg. Co.....
.....East Boston, Mass.
Maryland Steel Co.....
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Milwaukee Dry Dock Co., Milwaukee.
Mosher, Chas. D.....New York.
Newport News Ship Building Co....
.....Newport News, Va.
New York Ship Building Co.....
.....Camden, N. J.
Northwestern Steam Boiler & Mfg. Co. ..... Duluth, Mich.
Quintard Iron Works Co., New York.
Roach's Ship Yard.....Chester, Pa.
Sheriffs Mfg. Co.....Milwaukee.
Superior Ship Building Co.....
..... Superior, Wis.
Thropp, J. E. & Sons Co.....
.....Trenton, N. J.
Toledo Ship Building Co.....Toledo.
Trout, H. G.....Buffalo.

### ENGINE ROOM TELEGRAPH CALL BELLS, ETC.
Cory, Chas. & Son.....New York.
Marine Mfg. Supply Co., New York.

### ENGINEERING SPECIALTIES AND SUPPLIES.
Lunkenheimer Co. ..... Cincinnati.
Northwestern Steam Boiler & Mfg. Co. ..... Duluth, Minn.

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Hunt, Robt. W. & Co.....Chicago.
Kidd, Joseph.....Duluth, Minn.
Mosher, Chas. D.....New York.
Nacey, James ..... Cleveland.
Roelker, H. B.....New York.
Wood, W. J.....Chicago.

### FANS.
American Blower Co., Detroit, Mich.

### FEED WATER PURIFIERS AND HEATERS.
Ross Valve Co.....Troy, N. Y.
Wheeler Condenser & Engineering Co. ..... New York.

### FIXTURES FOR LAMPS, OIL OR ELECTRIC.
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Parker Bros. Co., Ltd.....Detroit.
Pickands, Mather & Co., Cleveland.
Pittsburg Coal Co.....Cleveland.
Smith, Stanley B., & Co., Detroit.
Toledo Fuel Company, .....Toledo, O.

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### GAS BUOYS.
Safety Car Heating & Lighting Co..
..... New York

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Chase Machine Co.....Cleveland.

### GAUGES, STEAM AND VACUUM.
Lunkenheimer Co. ..... Cincinnati.

### GAUGES, WATER.
Lunkenheimer Co.....Cincinnati, O.

### GENERATING SETS.
General Electric Co.....
.....Schenectady, N. Y.

### GRAPHITE.
Dixon Crucible Co., Joseph.....
.....Jersey City, N. J.

### HAMMERS, STEAM.
Chase Machine Co.....Cleveland.

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American Blower Co., Detroit, Mich.

### HOISTS FOR CARGO, ETC.
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..... Cleveland.
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..... Cleveland.
Chase Machine Co.....Cleveland.
Dake Engine Co.....
.....Grand Haven, Mich.
General Electric Co.....New York.
Hyde Windlass Co.....Bath, Me.
Marine Iron Co.....Bay City.

### HOLLOW STAYBOLT IRON.
Falls Hollow Staybolt Co.....
.....Cuyahoga Falls, O.

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Great Lakes Engineering Works....
..... .... Detroit.

### HYDRAULIC TOOLS.
Watson-Stillman Co., The.....
..... New York.

### ICE MACHINERY.
Great Lakes Engineering Works....
..... Detroit.
Roelker, H. B.....New York.

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American Injector Co.....Detroit.
Jenkins Bros.....New York.
Lunkenheimer Co. ..... Cincinnati.
Penberthy Injector Co.....
..... Detroit, Mich.

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Elphicke, C. W. & Co.....Chicago.
Gilchrist & Co., C. P.....Cleveland.
Hawgood & Co., W. A., Cleveland.
Helm & Co., D. T.....Duluth.
Hutchinson & Co.....Cleveland.
McCarthy, T. R.....Montreal.
McCurdy, Geo. L.....Chicago.
Mitchell & Co.....Cleveland.
Parker Bros. Co., Ltd.....Detroit.
Peck, Chas. E. & W. F.....
.....New York and Chicago.
Prindiville & Co.....Chicago.
Richardson, W. C.....Cleveland.
Sullivan, D. & Co.....Chicago.

# Buyers' Directory of the Marine Trade---*Continued.*

**IRON ORE AND PIG IRON.**
Bourne-Fuller Co.....Cleveland, O.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co., Cleveland.

**LAUNCHES—STEAM, NAPHTHA, ELECTRIC.**
Truscott Boat Mfg. Co.....St. Joseph, Mich.

**LIFE PRESERVERS, LIFE BOATS, BUOYS.**
Armstrong Cork Co.....Pittsburg.
Carley Life Float Co.....New York, N. Y.
Drein, Thos. & Son..... Wilmington, Del.
Kahnweiler's Sons, D.....New York.

**LIGHTS, SIDE AND SIGNAL.**
Russell & Watson.....Buffalo.

**LOGS.**
Nicholson Ship Log Co., Cleveland.
Walker & Sons, Thomas..... Birmingham, Eng.

**LUBRICATING GRAPHITE.**
Dixon Crucible Co., Joseph.....Jersey City, N. J.

**LUBRICATORS.**
Lunkenheimer Co. ..... Cincinnati.

**LUMBER.**
Martin-Barriss Co. ..... Cleveland.

**MACHINISTS.**
Chase Machine Co.....Cleveland.
Hickler Bros., Sault Ste. Marie, Mich.
Lockwood Mfg. Co.....East Boston, Mass.

**MACHINE TOOLS (WOOD WORKING).**
Atlantic Works, Inc....Philadelphia.

**MARINE RAILWAYS.**
Hickler Bros., Sault Ste. Marie, Mich.

**MARINE RAILWAYS, BUILDERS OF.**
Crandall & Son, H. I.....East Boston, Mass.

**MATTRESSES, CUSHIONS, BEDDING.**
Fogg, M. W.....New York

**MECHANICAL DRAFT FOR BOILERS.**
American Ship Building Co..... Cleveland.
Detroit Ship Building Co., Detroit.
Great Lakes Engineering Works.... Detroit.

**METALLIC PACKING.**
Katzenstein, L. & Co., New York.
The National Metallic Packing Co..
.....Oberlin, O.

**MOTORS, GENERATORS—ELECTRIC.**
General Electric Co.....Schenectady, N. Y.

**NAUTICAL INSTRUMENTS.**
Ritchie, E. S., & Sons..... Brookline, Mass.

**NAVAL ARCHITECTS.**
Hynd, Alexander .....Cleveland
Kidd, Joseph .....Duluth, Minn.
Mosher, Chas. D.....New York.
Nacey, James .....Cleveland
Wood, W. J.....Chicago

**OAKUM.**
Stratford, Oakum Co.....Jersey City, N. J.

**OILS AND LUBRICANTS.**
Dixon Crucible Co., Joseph.....Jersey City, N. J.

**PACKING.**
Jenkins Bros.....New York.
Katzenstein, L. & Co...New York.
Robertson, Jos. L. & Sons.....New York.
The National Metallic Packing Co... Oberlin, O.
Republic Belting & Supply Co.....Cleveland, O.

**PAINTS.**
Baker, Howard H. & Co....Buffalo.
Upson-Walton Co.....Cleveland.

**PATTERN SHOP MACHINERY.**
Atlantic Works, Inc. ..Philadelphia.

**PILE DRIVING AND SUBMARINE WORK.**
Buffalo Dredging Co.....Buffalo.
Dunbar & Sullivan Dredging Co.... Buffalo.
Great Lakes Dredge & Dock Co.... Chicago.
Hickler Bros..Sault Ste. Marie, Mich.
Hubbell Co., H. W...Saginaw, Mich.
Parker Bros. Co., Ltd.....Detroit.
Smith Co., L. P. & J. A...Cleveland.
Starke Dredge & Dock Co., C. H... .....Milwaukee.
Sullivan, M.....Detroit.

**PIPE, WROUGHT IRON.**
Bourne-Fuller Co.....Cleveland, O.

**PLANING MILL MACHINERY.**
Atlantic Works, Inc....Philadelphia.

**PLATES—SHIP, STRUCTURAL, ETC.**
Bourne-Fuller Co.....Cleveland, O.
Otis Steel Co.....Cleveland.

**PRESSURE REGULATORS.**
Ross Valve Co.....Troy, N. Y.

**PROPELLER WHEELS.**
American Ship Building Co..... Cleveland.
Atlantic Works ..East Boston, Mass.
Cramp, Wm. & Sons..Philadelphia.
Detroit Ship Building Co....Detroit.
Fore River Shipbuilding Co..... Quincy, Mass.
Great Lakes Engineering Works.... Detroit.
Hyde Windlass Co.....Bath, Me.
Lockwood Mfg. Co.....East Boston, Mass.
Milwaukee Dry Dock Co.....Milwaukee.
Newport News Ship Building Co.. .....Newport News, Va.
Roelker, H. B.....New York.
Sheriffs Mfg. Co.....Milwaukee.
Superior Ship Building Co.....Superior, Wis.
Thropp & Sons Co., J. E.....Trenton, N. J.
Toledo Ship Building Co.....Toledo.
Trout, H. G.....Buffalo.

**PROJECTORS, ELECTRIC.**
General Electric Co.....Schenectady, N. Y.

**PUMPS FOR VARIOUS PURPOSES.**
Great Lakes Engineering Works.. ..... Detroit.
Kingsford Foundry & Machine Works .....Oswego, N. Y.
Wheeler Condenser & Engineering Co. .....New York.

**REFRIGERATING APPARATUS.**
Great Lakes Engineering Works.... ..... Detroit.
Roelker, H. B.....New York.

**REGISTER FOR CLASSIFICATION OF VESSELS.**
Great Lakes Register.....Cleveland.

**RIVETS, STEEL FOR SHIPS AND BOILERS.**
Bourne-Fuller Co.....Cleveland, O.

**RUBBER SUPPLIES.**
Republic Belting & Supply Co..... Cleveland, O.

**SAFETY VALVES.**
Lunkenheimer Co.....Cincinnati.

**SAIL MAKERS.**
Baker, Howard H. & Co....Buffalo.
Upson-Walton Co.....Cleveland.

**SALVAGE COMPANIES.**
See Wrecking Companies.

**SEARCH LIGHTS.**
General Electric Co.....Schenectady, N. Y.

**SHEARS.**
See Punches, and Shears.

**SHIP AND BOILER PLATES AND SHAPES.**
Bourne-Fuller Co.....Cleveland, O.
Otis Steel Co.....Cleveland.

**SHIP BUILDERS.**
American Ship Building Co..... Cleveland.
Atlantic Works ..East Boston, Mass.
Buffalo Dry Dock Co.....Buffalo.
Cramp, Wm. & Sons..Philadelphia.
Chicago Ship Building Co..Chicago.
Detroit Ship Building Co....Detroit.
Fore River Ship Building Co..... ..Quincy, Mass.
Great Lakes Engineering Works.... .....Detroit.
Lockwood Mfg. Co.....East Boston, Mass.
Manitowoc Dry Dock Co.....Manitowoc, Wis.
Maryland Steel Co.....Sparrow's Point, Md.
Milwaukee Dry Dock Co..... Milwaukee.
Newport News Ship Building Co... .....Newport News, Va.
New York Shipbuilding Co..... .....Camden, N. J.
Roach's Ship Yard.....Chester, Pa.
Shipowner's Dry Dock Co..Chicago.
Toledo Ship Building Co.....Toledo.

**SHIP CHANDLERS.**
Baker, Howard H. & Co....Buffalo.
Marine Mfg. & Supply Co..... New York
Upson-Walton Co.....Cleveland.

**SHIP DESIGNERS.**
Kidd, Joseph .....Duluth.
Steel, Nacey, & Hynd....Cleveland.
Wood, W. J.....Chicago.

Alphabetical Index of Advertisers

on page 49 this issue.

# Buyers' Directory of the Marine Trade---*Continued.*

**SHIP LANTERNS AND LAMPS.**
Upson-Walton Co..... Cleveland.

**SHIP TIMBER.**
Martin-Barriss Co.....Cleveland.

**SIGNALS—SUBMARINE.**
Submarine Signal Co.....Boston

**SMOOTH-ON COMPOUND, FOR REPAIRS.**
Smooth-On Mfg. Co.....
.....Jersey City, N. J.

**STAYBOLT IRON OR STEEL BARS, HOLLOW OR SOLID.**
Falls Hollow Staybolt Co.....
.....Cuyahoga Falls, O.

**STEAM VESSELS FOR SALE.**
Holmes, Samuel .....New York.
McCarthy, T. R.....Montreal, Can.

**STEAMSHIP LINES, PASS, AND FREIGHT.**
American Line .....New York.
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Boston Steamship .....Boston.
C. & B. Transit Co.....Cleveland.
International Mercantile Marine Co.
..... Philadelphia.
Mallory Line .....New York.
New York & Cuba Mail S. S. Co..
.....New York.
Red Star Line .....New York.

**STEAM SPECIALTIES.**
Robertson, Jas. L. & Sons ..New York.

**STEEL CASTINGS.**
Otis Steel Co.....Cleveland.

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Chase Machine Co.....Cleveland.
Dake Engine Co.....
.....Grand Haven, Mich.
Detroit Ship Building Co....Detroit.
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Marine Mfg. & Supply Co.....
..... .....New York.
Sheriffs Mfg. Co.....Wilwaukee.

**SUBMARINE DIVING APPARATUS.**
Morse & Son, A. J.....Boston.
Schrader's Son, Inc. A....New York.

**SURVEYORS, MARINE.**
Hynd, Alexander .....Cleveland.
Parker Bros. Co., Ltd.....Detroit.
Nacey, James .....Cleveland.
Steel, Adam .....Cleveland.
Wood, W. J.....Chicago.

**TESTS OF MATERIALS.**
Hunt, Robert W. & Co....Chicago.
Lunkenheimer Co....Cincinnati, O.

**THERMIT.**
Goldschmidt Thermit Co., .....
..... New York City.

**TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.**
Watson-Stillman Co.....New York.

**TOOLS, WOOD WORKING.**
Atlantic Works, Inc....Philadelphia.

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.....Providence, R. I.
Chase Machine Co.....Cleveland

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Donnelly Salvage & Wrecking Co..
.....Kingston, Ont.
Great Lakes Towing Co..Cleveland.

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..... Boston.

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Lunkenheimer Co.....Cincinnati.
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Lunkenheimer Co.....Cincinnati.
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..... .....Cleveland, O.
Ross Valve Co.....Troy, N. Y.

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Douglas, G. L. Jr.....Duluth
Elphicke, C. W. & Co.....Chicago.
Hall, John B.....Buffalo.
Helm & Co., D. T.....Duluth.
Hawgood & Co., W. A....Cleveland.
Holmes, Samuel .....New York.
Hutchinson & Co.....Cleveland.
McCarthy, T. R.....Montreal.

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Mitchell & Co.....Cleveland.
Parker Bros. Co., Ltd.....Detroit.
Prindiville & Co.....Chicago.
Richardson, W. C.....Cleveland.
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Lunkenheimer Co.....Cincinnati, O.

**WHISTLES, STEAM.**
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American Ship Building Co.....
..... .Cleveland.
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Hyde Windlass Co.....Bath, Me.
Marine Mfg. & Supply Co.....
..... .....New York.

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